
# ALCOHOL HARM-REDUCTION INTERVENTIONS IN A YOUNG ADULT POPULATION

Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctor of Philosophy by Natasha Clarke

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Natasha Clarke

## Abstract

The purpose of this thesis was to assess the effectiveness of a variety of harm-reduction interventions in a young adult, majority student population. Chapter One discussed harm-reduction interventions and labelled them under two broad categories: those that target the reflective system and those that target the impulsive system, based on the reflective/impulsive model of drinking behaviour and Holland et al's (2013) typology of choice architecture interventions. Chapter Two and Three assessed interventions targeting the reflective system: brief personalised interventions (BPIs) and drinking campaigns (fear campaigns and 'responsible drinking' messages). Results indicated that BPIs were effective in reducing drinking over a two week period but offered no additional benefit to that of an active control. Anti-drinking campaign posters were compared to pro-drinking campaign posters and were overall ineffective in reducing motivation to drink. Interventions aiming to target the impulsive system included labelling and glass shape. Chapters Four, Five, Six and Seven investigated unit and nutritional glass labelling and results demonstrated that labels did not reduce ad libitum drinking, although findings in Study Five indicate that exercise labelling warrants further investigation, particularly in a female sample. Chapter Eight investigated the effect of glass shape on drinking speed. In contrast to previous glass shape findings (Attwood et al., 2012), a curved glass did not reduce drinking speed compared to a straight glass. Taken together, the studies in these thesis demonstrated that interventions targeting the reflective system by providing information and encouraging self-monitoring behaviour can reduce drinking if engagement is maximised and interventions targeting the impulsive system were overall ineffective in changing behaviour. These studies highlighted that hypothesised behaviour change mechanisms need to be clearly defined in such interventions. The majority of these studies were carried out in a semi-naturalistic bar-laboratory where alcohol was administered, therefore it is posited that this may have contributed to the ineffectiveness of the interventions. This is supported by the demonstrated influence of the pro-drinking environment on drinking behaviour throughout this thesis, which when paired with the existing habits and student drinking culture decrease the likelihood of intervention benefits. Restricting the pro-drinking nature of the environment, alongside interventions that target both the impulsive and reflective systems may prove most beneficial.

## Declaration

No portion of this work has been submitted in support of any other application for degree or qualification at this or any other University or institute of learning.

# Chapter One

# General Introduction

### 1.1 Alcohol use and prevalence

The harmful use of alcohol is a global problem, resulting in 3.3 million deaths each year (WHO, 2014); it is the world's leading risk factor for death among young males (15-59 years) (WHO, 2011) and the third biggest lifestyle risk factor for disease and death in the UK after smoking and obesity (HM Government, 2012). In England around 9 million adults drink at levels that pose some risk to their health and 2.2 million drink at a higher-risk of harm, with the total cost to society of alcohol-related harm estimated at £21 billion (PHE, 2014). Over the past 40 years the amount of alcohol consumed in the United Kingdom has risen (Weissenborn & Nutt, 2012) and this is said to be attributed to a number of factors such as greater affordability, higher strength alcohol and an emphasis on advertising, particularly aimed at younger individuals (Anderson, deBruijn, Angus, Gordon & Hastings, 2009b). Despite recent statistics suggesting that drinking rates may be declining in the younger population, due to a decrease in binge drinking and a higher proportion of abstainers (ONS, 2015), those that do drink still consume alcohol at levels posing a great risk to their health. Furthermore, alcohol consumption is often under-reported (Stockwell et al., 2004).

Research indicates that the majority of adults in the UK drink alcohol and many drink more than recommended by the Department of Health. New guidelines (14 units per week for both men and women) were introduced in 2016 (Department of Health, 2016) but the following studies are based on previous guidelines of 14 units per week for women and 21 units per week for men. One UK unit is equal to 10ml of pure alcohol, calculated by the volume of the drink and the alcohol strength (alcohol by volume [ABV]) (Department of Health, 2016). National statistics suggest that both men and women report drinking above these limits regularly, with 26.8% of those who drink bingeing on their heaviest drinking day (ONS, 2017). In a young adult population, alcohol bingeing is more common, and 37.3% of drinkers aged 16-

24 participate in at least one heavy drinking session (binge) a week (ONS, 2017). There has been a continuous rise in the number of admissions to hospitals over the past 20 years in both males and females, and the rate of alcohol-related deaths has doubled in females (ONS, 2013).

There are numerous harms associated with heavy drinking. There are direct effects such as liver disease, for example the mortality rate for liver disease has increased by over 250% in the past 40 years, whereas those for all other major diseases have fallen (British Liver Trust, 2009). The highest number of alcohol-related hospital admissions in 2013/14 were due to cardiovascular disease, 7% more than the year before (HSCIC, 2015). Alcohol consumption also has an effect on mental health and increases the risk of a variety of mental illnesses, such as depression (Fergusson, Boden & Horwood, 2009). In addition, there are the indirect effects; over ten people a week die from traffic accidents due to intoxication (Department for Transport, 2009), it is a significant factor in 'date-rape' vulnerability (ACMD, 2008) and almost half (49%) of all violent crime is related to alcohol (ONS, 2012).

There is particular concern regarding students, with those progressing to higher education (HE) showing an increase in consumption compared to their peers in the general population (Gill, 2002). In the UK there are high levels of alcohol-related risk and harm (62%) in undergraduates, with one in five students showing a likelihood of having a diagnosable alcohol use disorder (Heather et al., 2011). As well as long-term risks associated with this level of drinking, there are also short term consequences, such as increased risk of assault and injuries, blackouts, unplanned sexual activity and poor academic performance (Merrill & Carey, 2016). With a constant increase in student numbers (Bolton, 2012), students represent a high-risk population for alcohol-related harm. Successful drink reduction strategies for this population would offer significant benefit for the individual and wider society.

### 1.2 Drinking guidelines

To be able to drink at a safe level it is essential that individuals have accurate information regarding drinking guidelines. In January 2016 new guidelines were introduced, with a recommendation for both males and females to drink no more than 14 units per week, spread over three days or more. There is currently no guidance for

daily unit consumption, due to the individual variation in short-term risks (Department of Health, 2016). These guidelines were informed by a new review on alcohol and cancer risk (Committee on Carcinogenicity, 2015), indicating that drinking any amount of alcohol increases the risk of a range of cancers. Given that the current research was conducted and analysed between 2013 and 2016, this thesis will refer to the previous guidelines. Previous guidelines are no more than three to four units of alcohol per day for men and two to three units of alcohol per day for women and weekly guidelines of no more than 21 units for men and no more than 14 units for women (NHS, 2013). Drinking more than these amounts puts drinkers in the 'increased-risk' category, leading to effects such as less energy, depression, stress, insomnia, impotence, risk of injury and high blood pressure (Drummond et al., 2014). Binge drinking is defined as consuming double the daily guidelines (≥8 units for men, ≥6 units for women) during one drinking occasion (Cabinet Office, 2004). Drinking more than eight units a day (or 50 units a week) for men and six units a day (or 35 units a week) for women puts drinkers in the 'high-risk' category. This includes all of the risks associated with the 'increased-risk' category, with the addition of memory loss, risk of liver disease, cancer and alcohol dependence (Drummond et al., 2014).

### 1.3 Harm-reduction and alcohol policy

Alcohol-related harm is not confined to regular heavy drinkers or those diagnosed with alcohol use disorders; light and moderate drinkers who occasionally drink at high risk levels are also responsible for alcohol's burden on society, as irregular drinking with high variation and drinking to intoxication is detrimental (Popova, Rehm, Patra & Zatonski, 2007). Furthermore, non-drinkers can become victims of alcohol-related harms (Shield, Kehoe, Gmel, Rehm & Rehm, 2012). Thus, the significant harm from alcohol is both from direct and indirect effects.

In order to reduce the harms associated with alcohol, many countries employ strategies, including the introduction of alcohol policies, which aim to minimise alcohol's harmful effects (Babor et al., 2003). Alcohol policy is defined as measures by government to control supply and demand, minimise alcohol-related harm and promote public health (WHO, 2004). They have been particularly prominent in recent years as the marked increase in consumption has led to its rise in the political

agenda (Nicholls, 2012). Policies regarding the dangerous use of alcohol focus on harm-reduction methods, which involve a practical approach to reduce the negative consequences of drinking (Marlatt & Witkiewitz, 2010). Harm varies widely in its definition and can be at an individual, community and a societal level (which vary between cultures and settings), thus complete harm-reduction strategies should incorporate these various levels (Collins et al., 2012). Harm-reduction has been described as reflecting a humanistic perspective, with the view that individuals will make positive health choices with adequate support, empowerment and education. It has also been described as pragmatic as it refers to effective strategies to reduce overall harm scientifically, within the belief system of a specific culture (Collins et al., 2012). Harm-reduction strategies have become increasingly popular as it is recognised that even if individuals are aware of the negative effects of a high-risk behaviour, the behaviour may still be carried out (Collins et al., 2012). The goal of most harm-reduction approaches is to not ignore or condemn the harmful behaviours, but to meet individuals at their level and work to minimise the harmful effects (Marlatt & Witkiewitz, 2010) and protect society from the negative consequences of excessive drinking (Peele, 2006). This approach does not rely on the unrealistic goal of abstinence, and identifies that heavy drinking is inevitable, particularly in certain societies and populations (i.e. in young adults).

In England, current responsibility for alcohol policy is shared between the Home Office and the Department of Health and over the past 10 years alcohol policy has developed considerably. Between 2004 and 2010 the basis of alcohol policy was the Alcohol Harm Reduction Strategy for England (AHRSE) (Cabinet Office, 2004). This set out the Government's strategy for tackling the harms and costs of alcohol misuse in England with the aim of preventing any further increase in alcohol-related harms. The policy of the 2010-2015 Conservative and Liberal Democrat coalition Government's Alcohol Strategy (HM Government, 2012) established a commitment to ensure policy tackled binge drinking without penalising responsible drinkers, or pubs and industries. It had ambitions to reduce the number of individuals drinking above NHS guidelines, reduce binge drinking, reduce alcohol-related deaths, and change behaviour regarding the acceptance of drinking that causes harm to both the drinkers and those around them. For example, it was posited that by informing the public on alcohol guidelines and providing access to information regarding the safe

consumption of alcohol, each individual can remain responsible for their own drinking which will also result in an overall change in the drinking culture (Baggott, 2010). One of their methods for this was the 'Choose Less Booze' Change4Life marketing campaign (Department of Health, 2009). This was developed to inform about the risks of drinking above the lower-risk guidelines and to provide tools such as tips to reduce drinking. By giving this information it was argued that individuals can make responsible and informed choices about their drinking.

The current alcohol strategy also supports the Responsibility Deal Alcohol Network (RDAN), which was set up with alcohol industry representatives and health organisations. The core commitment is to 'foster a culture of responsible drinking, which will help people to drink within the guidelines' (HM Government, 2012, p17). Current pledges include alcohol labelling, awareness of alcohol units and calorie information and alcohol education. Through the Responsibility Deal companies have agreed, at least in principle, to encourage a culture of responsible drinking by providing unit information and the lower-risk drinking guidelines, and to give simple and consistent unit and health information in pubs and shops. However, there is much criticism of such a heavy involvement of the alcohol industry in shaping alcohol policy. Many health groups withdrew from the Responsibility Deal in 2011 as they stated it was not advancing public health objectives. This was suggested to be due to a lack of robust evidence base and a prioritisation of industry over health, therefore the deal lacks support beyond government and industry (McCambridge, 2012). Industry has been a continuous influence on shaping and implementing alcohol policies, and prior to the Responsibility Deal the industry have been key partners in achieving policy goals (Hawkins, Holden & McCambridge, 2012). Given this, it is not surprising that current UK alcohol policies are closer to those advocated by the alcohol industry than by the existing evidence base (Gordon & Anderson, 2011; Hawkins et al., 2012).

The result of this influence is that often the responsibility for alcohol-related harm is placed on the individual consumer (Hawkins et al., 2012). It also means that policies which are most effective are often not emphasised, and those shown to be ineffective are promoted. For example, the assessment of the EU strategy on alcohol in 2006 showed that it lacked support for actions that have been shown to be effective (e.g. pricing and taxation) and is extensive in its emphasis on those policies shown to be

least effective (e.g. information and education) (Gordon & Anderson, 2011). Government focus is consistently on marketing and standalone information-provision strategies, yet the evidence basis for these are weak and they have been shown to be ineffective on their own (Baggott, 2010). Despite governance systems having an obligation to reduce the harm caused by alcohol and provide conditions which allow individuals to make healthy choices, they do not propose actions that accurately address the size of the problem (Gordon & Anderson, 2011) and it has been emphasised that a more consistent message is needed (Wettlaufer, Cukier, Giesbrecht & Greenfield, 2012). Therefore the assessment of potentially effective harm-reduction interventions is vital to inform evidence-based policy, which is currently lacking (Bonner & Gilmore, 2012b).

In addition, current harm-reduction methods are 'blanket strategies', focussing on the population as a whole and not considering the differences amongst them. Individuals not only have physical differences, but they have different social situations and learning experiences (Stonard, 2013). Therefore, although strategies may be useful for some, it is unlikely they will be equally beneficial for all populations. For example, the term 'sensible' or 'responsible' drinking may impact an older population who want to change their behaviour, yet it is unlikely that this term will have meaning in a young, heavy drinking, high risk-taking population with varying drinking patterns (O'Neil, Martin, Birch, Oldam & Newbury-Birch, 2015). Drinking is often paired with fun and socialising with friends (Kuntsche, Knibbe, Gmel & Engels, 2005); a time when being 'sensible' is not considered (Stonard, 2013). This suggests both existing and future harm-reduction strategies should be tailored to and tested in specific populations.

### 1.4 Why is it so difficult for individuals to make sensible drinking choices?

#### 1.4.1 Self-control

Individuals often do not act in their own best interests, for example, by partaking in unhealthy behaviours, such as alcohol and drug abuse, overeating and smoking (Quigley, 2013). To be able to live a healthy life an individual needs to have a degree of self-control. Self-control consists of a deliberate and conscious subset of self-regulation processes (Baumeister, Vohs & Tice, 2007b), and is defined as the ability to alter dominant responses or inner states (such as impulses, urges, emotions and

thoughts) and replace them with a different response in the pursuit of long-term goals (Baumeister, Schmeichel & Vohs, 2007a).

Much self-regulation research focuses on the strength model (Baumeister, Bratslavsky, Muraven & Tice, 1998), where self-control depends on limited resources. The argument that self-control depends on a limited energy resource stems from the finding that control deteriorates over time and from repeated exertions (Baumeister, Heatherton & Tice, 1994). This can be demonstrated by laboratory research, for example, resisting the temptation to eat chocolates and cookies and forcing oneself to eat a healthy option instead, causes participants to give up faster on a frustrating task than those who have not exerted self-control (Baumeister et al., 1998). This has also been given the term ego depletion (Baumesiter et al., 1998).

Due to the finding that self-control performance deteriorates after initial exertions, Baumeister and colleagues (2007b) made the analogy between self-control and a muscle. Firstly, exerting self-control regularly can improve willpower strength, for example improvement in laboratory tasks can be seen after daily exercises in self-control. These improvements are suggested to be unlikely to be due to practise effects due to the differences in the tasks (Baumeister, Galliot, DeWall & Oaten, 2006). Furthermore, when the self-control muscle tires, self-controllers can preserve their remaining strength, this has been likened to an athlete conserving their remaining strength when muscles are tired (Baumeister et al., 2007b). For example, if later self-control exertion is required then current performance on a task is more affected than if this self-control exertion is not expected (Muraven, Smueli & Burkley, 2006). Finally, individuals can exert self-control if the stakes are high enough, for example, offering incentives to motivate participants can counteract the deterioration effects. However, this depletes resources even further and if an unanticipated task is given, ego depletion is even more apparent (Muraven & Slessareva, 2003). This is compared to the ability of athletes to exert strength at vital moments, but tiredness is unavoidable at a certain stage (Baumeister et al., 2007b).

Low self-control is associated with increased susceptibility to various drug and alcohol abuse, eating disorders and risky sexual behaviour (Baumeister, Heatherton & Tice, 1993; Quinn & Fromme, 2010; Tangney, Baumeister & Boone, 2004). For example, low self-control has been shown to predict higher alcohol consumption

among adults (Cook, Young, Taylor & Bedford, 1998; Gerich, 2014) and diminished self-control can contribute to problem behaviours, including alcohol consumption (Baumeister et al., 2007b). Muraven and colleagues (Muraven, Collins, Shiffman & Paty, 2005) found that over a three-week period participants were more likely to drink in excess of self-imposed limits if they had experienced a higher than average level of self-control demands. In a laboratory environment, Christiansen, Cole and Field (2012) demonstrated similar results in which ego-depletion manipulation led to increased beer consumption, even when participants were given an incentive to prevent them from drinking. Furthermore, this was mediated by self-reported effort expended, supporting the strength model of self-control.

If self-control is a limited resource, then key questions include what makes some individuals successful at exerting self-control (e.g. trait self-control), and why are individuals capable of exerting it in some situations and not in others (e.g. variability of self-control within an individual). It is suggested that this is due to cognitive biases in the way we make decisions, meaning that we are prone to making predictable and systematic errors in judgement, despite having specific intentions otherwise (Quigley, 2013). For example, by overemphasising immediate, relative to delayed, benefits and by displaying a willingness to impose self-control on future selves, but lacking the self-control to stick to long-term goals once the future becomes the present (Liu, Wisdom, Roberto, Lui & Ubel, 2014).

### 1.4.2 A dual process account of behaviour: the reflective-impulsive model

A prominent model that aims to explain the dynamics of self-control conflicts in health behaviour is the dual system, or reflective-impulsive, model (Strack & Deutsch, 2004). The reflective-impulsive model posits that there are two separate systems that interact jointly to guide behaviour: an explicit conscious system (reflective) and an implicit unconscious system (impulsive) (Strack & Deutsch, 2004). The basic assumption is that the reflective system uses a decision process to guide behaviour using knowledge about values and consequences. If a decision is made the reflective system activates the action or behaviour (e.g. drinking, which could be activated by the sight of alcohol) through a mechanism of intending (intending monitors the impulsive system and enables behaviour to be carried out). This system is described as goal-directed and rational, motivated by beliefs and

desires (Marteau, Hollands & Fletcher, 2012). In contrast, if a behaviour is triggered by the impulsive system, it may be carried out without any intentions or goals. The behaviour is activated automatically, which may have originated from the perceptual input of reflective processes (Strack & Deutsch, 2004). For example, the repeated experience of drinking will lead to an association between the concept of drinking, positive affect and the behaviour leading to the positive affect (e.g. drinking behaviour leads to positive experiences such as fun with friends). This then leads to a quicker, impulsive reaction (drinking) when the same environment in encountered in the future. These automatic responses are not in line with conscious desires and will occur even when the consequences of the behaviour are unwanted (Marteau et al., 2012).

These systems are said to operate in parallel and interact with each other at various stages. However, the information will always be processed in the impulsive system, therefore any perceptual input will be automatically processed first, and then it may or may not be processed in the reflective system. Furthermore, the reflective system requires a high amount of cognitive capacity (it will only control behaviour if there is enough cognitive capacity) and can be disturbed more easily, whereas the impulsive system requires little to no effort (Strack & Deutsch, 2004). It is therefore not surprising that behaviours are difficult to control, especially under situations that make it more likely that the impulsive system will guide behaviour. A high level of self-control is needed to process behaviours through the reflective system, but self-control is a limited source; the exertion used by the reflective system depletes these resources and they are only replenished after time has elapsed. When self-control resources have been depleted the ability to control subsequent behaviour is diminished; therefore, ego depletion leads to a state where behaviour is much more likely to be influenced by our environment and the impulsive system.

### 1.4.3 The reflective-impulsive model and health behaviours

Many health behaviours (such as drinking) can be framed in terms of this conflict between impulsive and reflective systems. When there is a health threat (such as the temptation to buy an alcoholic beverage), the reflective system assesses both the expectancy and values of this health threat and positive coping responses, and a behavioural decision is reached based on these appraisal processes (Hofmann, Friese

& Wiers, 2008). These are seen as conscious acts requiring willpower. However, often impulsive influences will arise (specifically with high cognitive load, emotional distress and alcohol intoxication) and this will usually be when a stimulus in the environment has a strong incentive value which has a hedonic component and leads to an action. For example consuming a beer (Hofmann et al., 2008). Friese and colleagues (2011) described the dual process theory in terms of health behaviour with the analogy of the 'horse and the rider'. The horse symbolises the automatic impulsive system and the rider symbolises the reflective system. To reduce risky health behaviours the focus is on both taming the horse by controlling our automatic reactions towards the environment and on strengthening the rider by practising self-control. Emphasising that control of both systems is important.

Depending on specific situations, health behaviours can be better predicted by reflective or impulsive systems. In an environment containing drinking cues, if the behaviour (drinking) has been carried out in this environment previously, then it is likely a drink will be consumed, even with the intention not to. This is particularly likely to be the case if cognitive load is high and if there is emotional distress (Hofmann et al., 2008). In one study, participants were told that they would complete a driving simulation and were then required to suppress their thoughts (by trying to think of a white bear). Before the expected simulation, participants were allowed to sample some beer (which should impair performance). Those whose resources were depleted (by suppressing thoughts) drank more alcohol, demonstrating that when the self's resources are depleted it is less likely to control alcohol intake effectively (Muraven, Collins & Nienhaus, 2002). Marteau and colleagues (2012) emphasise that automatic behaviours are best thought of along a continuum; although some behaviours are carried out without any conscious awareness, in others individuals will be aware of the cue and behaviour, but not the process linking the two. For example, an individual may be aware that seeing someone consume alcohol makes them desire a drink, but they may be unsure as to why they feel this desire.

## 1.5 Changing behaviour

### 1.5.1 Interventions that target the reflective system

The aim of behaviour driven health policy is to eliminate the biases between the reflective and impulsive systems to achieve health-affecting outcomes (Quigley,

2013). Interventions aimed at engaging the reflective system usually involve providing information to alter beliefs and attitudes, motivate with the prospect of future benefits, or help individuals develop self-monitoring skills. The premise is that if individuals have access to relevant information needed to make choices, then they will select choices which will produce positive health responses (Quigley, 2013).

Mass media campaigns aim to engage the reflective system to reduce risky drinking. These usually involve the provision of information to raise awareness of the dangers of high-risk drinking, social norms marketing to correct misperceptions surrounding drinking norms, or advocacy campaigns that aim to stimulate support for policy change (DeJong, 2002). A recent component of drinking campaigns is the provision of information encouraging individuals to drink in a responsible manner (e.g. 'Drink Responsibly' campaigns [Department of Health, 2010]). Fear campaigns can also be used, these include emotional and disturbing images or statements to portray the negative consequences of a health-risk behaviour (Brown & Locker, 2009). Responsible drinking campaigns have been shown to increase alcohol-related knowledge (Kalsher, Clarke & Wogalter, 1993; Fenaughty & MacKinnon, 1993) and lead to greater intentions to drink responsibly (York, Brannon & Miller, 2012) but most studies find that in regards to alcohol intake campaigns have little success (Anderson, Chisholm & Fuhr, 2009a; Wakefield, Loken & Hornik, 2010). In a review of mass media campaigns aimed to reduce drinking in US college students, it was concluded that evaluation of these campaigns is very limited (DeJong, 2002). Campaigns that use fear-evoking messages have shown mixed outcomes; a recent meta-analysis found inconsistency in results regarding the effectiveness of threatening communication in changing behaviour (Peters, Ruiter & Kok, 2013). In students, exposure to emotive anti-alcohol messages, such as unsettling medical images, produced lower estimates of the risk of alcohol compared to less emotive messages, showing these messages may have the opposite effect to that intended (Brown & Locker, 2009).

Mass media campaigns are criticised as they rarely fit the population as a whole. Therefore interventions that are individualised to suit the specific needs of each individual have become popular in recent years. One method is the use of brief personalised interventions (BPIs). These target the reflective system and are an individualised intervention that involve the delivery of short structured 'brief advice'

to encourage risky drinkers to lower their drinking levels (Kaner et al., 2013). The advice is based on personalised information (such as identifying consequences that are personally relevant, highlighting the practical costs of alcohol consumption, identifying risk reduction strategies and providing normative comparisons [Miller et al., 2013]), with the aim of increasing awareness of an individuals' own behaviour (Riper et al., 2013). There are mixed findings with BPI effectiveness in student populations. Some evidence shows that BPIs can be of benefit; in a review of interventions aimed at reducing binge drinking in which the majority were brief interventions, most were effective (Bridges & Sharma, 2015). Another review concluded that brief interventions could be successful in reducing drinking, reducing alcohol-related problems and decreasing peer perception of alcohol use (Ickes, Haider & Sharmer, 2015). However, other studies are not as encouraging. In a review of very brief web-based alcohol interventions (although some did), many failed to reduce alcohol use and there was no evidence to support their use in the reduction of alcohol-related problems (Leeman, Perez, Nogueira & DeMartini, 2015). Scott-Sheldon and colleagues (2014) concluded in their review that interventions containing personalised feedback enhance efficacy, particularly compared to assessment only. However, compared to active controls, the personalised interventions produce no additional benefit. Active controls are described in this review as alternative alcohol interventions (brief-alternative alcohol-related interventions, general health interventions or interventions that provide only alcohol education) (Scott-Sheldon, Carey, Elliot, Garey & Carey, 2014).

All the reviews discussed here emphasise that research findings are mixed and more research is needed to identify what types and components of reflective alcohol harm-reduction interventions may work in young adult populations, particularly as these interventions are consistently promoted in government alcohol strategies (HM Government, 2012). Furthermore, the majority of the studies are in an US college student population, therefore more research into interventions in a UK student population is warranted.

### 1.5.2 Interventions that target the impulsive system

One way to achieve more positive outcomes may be by targeting the impulsive system, as by deliberately shaping the immediate environment it may be possible to

produce unconscious behaviour change. This could be particularly effective when there are pro-drinking environmental cues (e.g. a bar context) and when cognitive load is high (e.g. when interacting with peers), factors that override the reflective system (Liu et al., 2014). This is called 'nudging' or 'choice architecture' (Thaler & Sunstein, 2008). Choice architecture refers to the characteristics of the environment or context in which a choice or decision is made. Thaler and Sunstein (2008) introduced the term 'libertarian paternalism', libertarian referring to the insistence that individuals should be free to do as they please, and paternalistic claiming that influencing behaviour to encourage healthy choices is legitimate. Therefore, this refers to policies that maintain or increase freedom of choice while attempting to move individuals toward healthier choices. It is emphasised that choice architecture should be designed in a way that stimulates a choice which improves the life of a person. It is not a tool for policy makers to get individuals to do what they want them to do, instead it makes healthy choices easier (Van Oorschot, Haverkamp, van der Steen & van Twist, 2013).

Shaping environments to cue certain behaviours is effective, e.g. the consumption of alcohol in young adults over the past 50 years is attributed in part to its marketing and availability (Marteau, Ogilvie, Roland, Suhrcke, & Kelly, 2011). Furthermore, it has also been suggested that particular aspects of drinking environments can lead to increased consumption. These include cheap alcohol, availability, loud music and crowding (Hughes et al., 2011). These are examples of how certain aspects of our environment may influence our choice in a negative way. Much of the time the decision about what alcohol product is consumed is made at the point of purchase (Anderson, Amaral-Sabadini, Baumberg, Jarl, & Stuckler, 2011). This may partly explain why some alcohol harm-reduction interventions, which are present in more general, non-drinking contexts have limited success. By providing meaningful information at point of purchase, it may be possible to affect decisions. This suggests that it would be feasible to alter the environment to encourage more responsible alcohol consumption.

A recent paper introduces a helpful definition and typology of choice architecture. Hollands and colleagues (2013) defined choice architecture interventions as:

*Interventions that involve altering the properties or placement of objects or stimuli within micro-environments with the intention of changing health-related behaviour. Such interventions are implemented within the same micro-environment as that in which the target behaviour is performed, typically require minimal conscious engagement, can in principle influence the behaviour of many people simultaneously and are not targeted or tailored to specific individuals* (Hollands et al., 2013, p. 3).

They introduced a typology, which consists of nine intervention types split into those that alter the properties of objects or stimuli and those that alter placement, or both. The existing evidence for the effects of choice architecture interventions on alcohol and tobacco use, diet and physical activity were reviewed. Only a limited number of these studies assessed alcohol choice architecture interventions (7.3%), but they came under five of the nine intervention type headings. Below is an outline of each alcohol intervention type and examples of studies covered by Hollands and colleagues (2013) with the addition of some that were not included in their review.

Labelling

Mandatory alcohol warning labels on alcohol products are adopted in over 20 countries (Wilkinson & Room, 2009). Recent reviews of health warning labels suggest that labels are underused and there is limited research on their effectiveness (Martin-Moreno et al., 2013; Knai, Petticrew, Durand, Eastmure & Mays, 2015). In the UK, drinkers are provided with information on standard units, daily intakes, a pregnancy warning and an optional responsibility statement (HM Government, 2012). The inclusion of standard drink size labels can be of benefit as they enable individuals to accurately track alcohol intake, however, individuals are often unaware of the significance of a standard drink. It has also been highlighted that this information could be used in the wrong way, for example by choosing the strongest drinks (Jones & Gregory, 2009). This is particularly relevant in a student sample, with over a third of students in a recent study indicating strength influences drink choice (Walker, Higgs & Terry, 2016). This stresses the importance of delivering this information alongside health information (Martin-Moreno et al., 2013). Daily intake information has been criticised due to the variation among individuals in terms of risk and drinking patterns, therefore recommendations are that these should not to be included on labels (Martin-Moreno et al., 2013). Health warnings could be an

effective method to translate risk information, however, with current UK labels developed by government in collaboration with the alcohol industry (HM Government, 2012), this may face some opposition (Martin-Moreno et al., 2013). Research, although limited, suggests that although current labels can increase awareness and encourage discussion, there is little or no measurable change in drinking behaviour (Knai et al., 2015, Stockwell, 2006). This has been suggested to be due to the location and style of the labels (Wilkinson et al., 2009) and it has been suggested that warning labels should be more noticeable, impactful and varied (Stockwell, 2006). Authors in a recent labelling review highlight that it is:

> *Striking that no country in the world currently requires disclosure of this information (caloric information) on packaging* (p. 1084, Martin-Moreno et al., 2013).

Therefore calorie information provision may be an alternative route in reducing consumption. Furthermore, in many drinking situations the drinker does not see the package, therefore warnings and labels may need to be extended beyond the original container (Wilkinson & Room, 2009). This indicates labelling is a relatively under researched area. Research into different forms of labels with novel and relatable information is required.

Prompting

These are described as interventions that contain standardised information to promote or raise awareness of, and motivation for, a behaviour (Hollands et al., 2013). Alcohol marketing strategies often overshadow health messages (Wakefield et al., 2010) and a higher exposure to marketing has been shown to increase drinking, particularly among young individuals (Anderson et al., 2009b). Point of purchase (POP) describes a promotional activity (e.g. price reductions, discounts) in a drinking context at the point where the purchase will be made (Jones, Barrie, Gregory, Allsop & Chikritzhs, 2015). There is limited research in the area, but an association has been shown between promotions and increased alcohol consumption. In US students, promotions such as lower prices and weekend beer specials were associated with increased heavy drinking in the month following (Kuo, Weschsler, Greenberg & Lee, 2003) and price promotions lead to increased alcohol consumption in lab-based studies (Skidmore & Murphy, 2011). Furthermore, it has been shown that

participants who participate in a promotion purchase 63.4% more beer and 16.7% more wine (Jones et al., 2015). Individuals seem to be aware of this association, with focus group findings showing a strong link between promotions and purchasing and consumption behaviour (Jones & Smith, 2011). These findings have been shown in real-life drinking environments (Hughes et al., 2011), for example in Scotland a decrease in alcohol sales was shown after restrictions on multi-buy promotions in 2011 (Beeston et al., 2013). However, not all research in the area is consistent. In a study investigating POP displays it was found that these displays actually caused a decrease in sale of the featured brand. The use of special POP displays led to a decrease in sales of featured wines from a specific US region, and led to an increase in sales from competitive regions (Areni, Duhan & Kiecker, 1999). Price promotions are not the only method of alcohol advertising shown to effect drinking behaviour. Positive portrayals of consuming alcohol have been shown to lead to mimicry of the behaviour (Ahn, Wu, Kelly & Haley, 2011) and with cigarette packaging individuals have been shown to ignore health warning and attend to branding (Maynard et al., 2014). This shows alcohol advertisements and marketing strategies at the point of purchase or consumption may have an effect on drinking behaviour, and could result in conflict within an individual when displayed alongside methods to reduce drinking. Consequently, methods to restrict these or replace with alternative messages may have a positive effect on drinking behaviour.

Functional design

Hollands and colleagues (2013) describe functional design as designing or adapting equipment or altering the function of the environment. The majority of interventions are food and diet studies, for example the effect of plate size on food intake (Koh & Pliner, 2009; Rolls, Roe, Halverson & Meengs, 2007). For alcohol interventions research includes the size and shape of a glass, where it has been found that participants consume and pour 20-30% more alcohol into a short wide glass compared to a tall slender glass, despite believing the opposite to be true (Wansink & van Ittersum, 2003; Wansink & van Ittersum, 2005). In drinking establishments, with pint and shot glasses, larger glasses have been shown to have larger pours (Kerr, Patterson, Koenen & Greenfield, 2009) and spending on wine is increased with larger glasses compared to standard-sized (Pechey et al., 2016). In an online study it was indicated that shape and capacity of wine glasses can influence volume

perception, with wider glasses under-filled and larger glasses over-filled (Pechey et al., 2015). In terms of actual consumption, in a student population one study showed that participants consumed pints faster from a curved glass than a straight glass, with a difference in drinking speed of 5 minutes (Attwood, Scott-Samuel, Stothart & Munafo, 2012). However, this finding is yet to be replicated. With the majority of glass shape and size studies focussed on pouring accuracy rather than drinking behaviour, the functional design of the glass is a promising area in which more research is needed.

Ambience and priming

Ambience is defined as the aesthetic or atmospheric aspects of the surrounding environment (Hollands et al., 2013). For example, the influence of background music on behaviour; classical music can influence shoppers to spend more money on wine compared to top forty (Areni & Kim, 1993) and drinking songs have been show to increase the amount spent on consumption compared to top forty or cartoon songs (Jacob, 2006). In one study, French music led to greater sales of French wines compared to German, with German music leading to the opposite effect (North, Hargreaves & McKendrick, 1999). Furthermore, a high volume of music in bars, compared to lower level of sound, can increase alcohol consumption and average speed of drinking (Guéguen, Jacob, Le Guellec, Morineau, & Lourel, 2008). Lighting can have an influence; with brighter lighting influencing shoppers to examine and handle more wine bottles (Areni & Kim, 1994). Aromas in drinking establishments have also been investigated, where researchers have found a lavender (but not lemon) aroma can increase purchasing of food and drink in a pizzeria (Guéguen & Petr, 2006). In a review on environmental factors in drinking venues and alcohol-related harm it was highlighted that loud music and a focus on music and dancing in bars is associated with higher levels of alcohol use and intoxication (Hughes et al., 2011). Priming is related to ambience and is defined as the placing of incidental cues in the environment to influence a non-conscious behavioural response (Hollands et al., 2013). For alcohol, this includes the studies on background music and auditory cues which also come under ambience (e.g. Jacob, 2006; North et al, 1999).

Choice architecture interventions have advantages over more traditional methods. They are usually simple and have low costs, furthermore they do not rely on the

communication of complex information, therefore they have the potential to be effective for any individual exposed to the environment (Marteau et al., 2012). However, Hollands et al (2013) stress that evidence to support choice architecture as a population health strategy is currently weak, particularly with drinking behaviour. Further research is needed, to investigate the success of alteration of different stimuli in the drinking environment in a variety of populations.

### 1.6 The importance of the drinking environment

An issue when investigating and implementing harm-reduction strategies is that many fail to take into account the effect of a drinking environment on decision making and behaviour. There are many aspects that affect our decisions when it comes to drinking outside of a neutral lab environment and consequently influence the potential benefit of harm-reduction interventions. These include, but are not limited to, intoxication, a bar environment and the company of others. Below gives an overview of the how each of these factors can have an impact on consumption and the ability to control drinking behaviour.

#### 1.6.1 Intoxication

Alcohol has been described as 'no ordinary commodity', it plays an important part in our economic community, yet it is often forgotten that it is a drug with toxic effects on the body (Babor et al., 2010). Desire for alcohol can increase following fairly small doses of alcohol (priming doses), which can result in further alcohol consumption and loss of control over drinking (de Wit, 1996). Therefore, it is particularly likely that our reflective system will be overridden if alcohol has been consumed, and alcohol is an important moderator of impulsive and reflective processes. This is because alcohol impairs our ability to inhibit prepotent responses, our perception is narrowed down to only salient cues in the environment and our long-term goals are likely to be forgotten (Hofmann et al., 2008). For example, a moderate dose (0.6 g/kg) of alcohol can increase choice for alcoholic drinks and self-reported desire for alcohol (Rose & Duka, 2006; Rose & Grunsell, 2008). It has been suggested that priming effects may, at least partly, be mediated by the effect of alcohol on attentional biases. Attentional bias towards alcohol cues increases after a priming dose which, in turn, encourages further drinking (Wiers, Rinck, Kordts, Houben & Strack, 2010). Furthermore, alcohol reduces an individual's ability to

inhibit their responding (de Wit, Crean & Richards, 2000), which makes it harder to control consumption and can lead to alcohol-seeking behaviour (Field, Wiers, Christiansen, Fillmore & Verster, 2010). Binge drinkers have been shown to be particularly sensitive to the disinhibiting effects of alcohol (Marczinski, Combs & Fillmore, 2007).

This is particularly relevant for a student population, who show high levels of binge drinking (Heather et al., 2011). Students are often intoxicated before they go out to a drinking establishment and this can lead to increased drinking and problems. For example 'pre-drinking' (consuming high amounts of alcohol before going out) has been shown to be associated with greater levels of intoxication (Foster & Ferguson, 2014) and negative experiences such as fighting or risk of being sexually molested (Hughes, Anderson, Morleo & Bellis, 2008).

### 1.6.2 Context

Drinking environments contain many cues that are associated with the consumption of alcohol (e.g. beer bottles, beer mats, alcohol brands), and these have an influence on drinking behaviour (Weafer & Fillmore, 2015). It is theorised that these cues become associated with drinking and the rewards associated with drinking, which increases the salience of the cues and leads to the activation of drinking behaviour when these cues are encountered in the future (Robinson & Berridge, 2008). Attention to alcohol cues has been shown to be associated with higher craving (Field & Cox, 2008) and in heavy drinkers there is an increased attentional bias towards alcohol cues (Field, Christiansen, Cole & Goudie, 2007). This suggests that in heavy drinking populations, such as students, these cues may be even more likely to activate drinking behaviour. This is supported by research which has shown large increases in subjective craving in student drinkers following alcohol cue exposure (Albery, Sharma, Noyce, Frings & Moss, 2015). In a bar-laboratory, the ability to refuse alcohol when offered is lower compared to a lecture environment (Monk & Heim, 2013b). Increased alcohol expectancy reaction times are found in a bar setting compared to a neutral setting (Wall, Hinson, McKee & Goldstein, 2001) and a bar-lab can increase alcohol consumption (Lau-Barraco & Dunn, 2009).

Outside of a lab environment, external cues such as the promotion of cheap drinks have been cited by young adult populations as reasons for binge drinking (Norman et

al., 1998; Carpenter et al., 2008). For example, alcohol consumption in students is encouraged by a 'wet' or pro-drinking environment; where alcohol is prominent and easily available (Kuo, Wechsleer, Greenberg & Lee, 2003). These pro-drinking environments correlate with binge drinking rates and have been shown to be directly associated with the number of drinks consumed by students in the past 30 days (Kuo et al., 2003). Smartphone technology has also given an insight into the real-time effect of environmental and social contexts, such as being in a pub, bar or club, on changes in alcohol-related cognitions; both are significant predictors of positive and negative outcome expectancies related to drinking (Monk & Heim, 2013a).

Together, these findings highlight the importance of assessing the effectiveness of interventions in more naturalistic drinking environments. Bar-labs are semi-naturalistic drinking environments which still allow for control of the context. They provide an ideal situation for initial testing of alcohol harm-reduction interventions.

### 1.6.3 Drinking in the company of others

Individuals usually consume in company of others and this has been shown to influence drinking behaviour. Research using a confederate paradigm shows that the observation of other peoples' drinking behaviour is one of the most important social determinants of an individual's drinking level (Larsen, Engels, Souren, Granic & Overbeek, 2010). With pairs of 'real' social acquaintances there is a large effect of social influence, which participants are unaware of (Dallas et al., 2014). This may be particularly the case for students, who mostly drink for social facilitation, and to improve social gatherings (Kuntsche et al., 2005) and it has been found that the more undergraduates are motivated to drink by social and enhancement factors, the more often they consume alcohol (Mobach & Macaskill, 2011).

A study investigating the nature of typical drinking occasions found that between 2009-2011, 84% of drinking occasions involved drinking in the company of others. (Ally, Lovatt, Meier, Brennan & Holmes, 2016). Furthermore, although on-trade drinking (drinking alcohol from venues such as pubs, nightclubs and hotels) is decreasing (IAS, 2013a), 33% of all drinking occasions involve on-trade drinking (Ally et al., 2016). In this study it was found that high risk drinking occasions (>12 units females/>16 units males) were particularly common when drinking was a social occasion with friends or colleagues and when drinking switched between on- and

off-trade. Younger adults have been shown to be major participants in on-trade drinking (Szmigin et al., 2008) and recognising alcohol consumption as a social practise has been raised as a vital issue in developing effective interventions (Supski, Lindsay & Tanner, 2016).

### 1.7 Changing student drinking

For many young adults, alcohol use is a normal part of their development (Schulenberg, Maggs & Hurrelmann, 1997). However, students are at high-risk for problem drinking (O'Malley & Johnston, 2002). When attending school, future university attendees have lower levels of drinking than their peers, this changes once they reach university and their drinking surpasses that of their non-university peers (Johnston, O'Malley, Bachman & Schulenberg, 2009). Among young individuals, lack of self-control is a factor in alcohol abuse (Friese & Hofmann, 2009). For example, in US college students it has been shown that when self-control is high, behaviours linked to alcohol abuse are less likely to be present (Lindgren, Neighbours, Westgate & Salemink, 2014). Additionally, self-control in students has been shown to predict the manner of drinking (e.g. bingeing), and the ability to limit or stop drinking (Pearson, Kite & Henson, 2013).

A university environment promotes heavy drinking (e.g. parties, increased socialising, moving away from home). Alcohol is a prominent component of the university experience (Thombs, 1999) and drinking has been strongly related to identity in a student (Carpenter et al., 2008). Research indicates that light and moderate drinking may have some benefits in terms of social relationships and decreasing subjective distress than those that abstain (Schulenberg et al., 2000). Being a student has been shown to be a significant predictor of increased positive outcome expectancies (Monk & Heim, 2013a) and focus group findings indicate that alcohol is central to the social life of university (Supski et al., 2016). However, university can also come with increased situations of psychological distress and it is common for students to use drinking as a coping mechanism (Park & Levenson, 2002).

This emphasises the importance of the harm-reduction approach (rather than promoting abstinence) for this population and strategies that target either or both the reflective (for successful self-control) and impulsive system (to promote a more 'dry'

environment) may be effective. In a pro-drinking context, especially at times of high cognitive load, efforts to alter the environment to make drinking heavily more difficult will be of worth. However, it is also important that young adults develop the necessary self-control skills to successfully self-regulate behaviour. This suggests a combination of strategies that target the impulsive system and those that target the reflective system to develop self-regulation skills and increase knowledge. However, investigation is required to establish which interventions may be successful; this experimental evaluation is required both in and outside of a drinking environment to identify which context interventions are best delivered in.

### 1.8 Interim summary

So far this thesis has discussed alcohol-related harms, alcohol guidelines and alcohol harm-reduction. Drinking behaviour and harm-reduction interventions are framed from a dual process perspective. Interventions that target the reflective system include mass media campaigns and BPIs. Findings with BPIs have been mixed, they have shown promise in US students (Bridges & Sharma, 2015), but more research is needed, particularly in a UK student population. Mass media campaigns have not been shown to be effective as a standalone drinking reduction method (Wakefield et al., 2010) and their effectiveness in the drinking environment is often not evaluated.

From dual process accounts it also seems sensible that, particularly due to the disinhibiting effect of alcohol and the automatic nature of drinking behaviour, targeting the impulsive system may lead to more positive harm-reduction outcomes. In terms of choice architecture interventions, labelling has been described as an under researched potential harm-reduction method that could have potential (Martin-Moreno et al., 2013). Many drinking occasions, particularly with a young adult population, will not involve the consumer seeing the alcohol package, therefore including health information on the side of the glass is a potential novel direction for labelling research. Furthermore, nutritional information is under used and may be more effective than unit content, which is often not relatable to individuals (Martin-Moreno et al., 2013). Structural changes to the environment, such as changes in glass shape, have shown promise in recent studies (e.g. Attwood et al., 2012). However, there are limited studies in the area; initial positive findings warrant replication.

In the real-world, harm-reduction interventions are often overshadowed by alcohol marketing strategies. The majority of studies assessing the effectiveness of harm-reduction interventions do not take this into account and are often carried out in a neutral lab environment. This is not representative of a typical drinking environment, in which individuals will often be in a bar setting, will be intoxicated and will most likely be in the company of others. Furthermore, students show high levels of alcohol-related harm and are surrounded by a pro-drinking environment. Therefore, altering the typical drinking environment may be an effective behaviour change route in this population.

### 1.9 Aims and hypotheses

The overall aim of this thesis is to investigate the effectiveness of a range of harm-reduction interventions in a young adult population. Specifically, the research investigates whether interventions that target the impulsive system may be more effective than those that involve engagement with the reflective system. The majority of the sample throughout this thesis are students. University is a time that heavily promotes drinking and students are surrounded by a 'pro-drinking' environment, therefore it may be beneficial to target this context, as well as targeting individual drinking. Several of the current studies were conducted in a bar-lab to determine whether interventions present at time of drinking can have an impact on alcohol-related behaviour.

From a theoretical perspective, this thesis asks three questions 1) Can we target the reflective system to change behaviour outside of the drinking environment? 2) Can we target the reflective system in the drinking environment? 3) Can we target the impulsive system in the drinking environment?

Study One (Chapter Two) investigated the effect of delivering a brief personalised intervention (BPI) compared to an active control in reducing drinking over a 2-week period. Given that this was assessing a BPI, the study was conducted outside of a typical drink environment. Findings demonstrated that an active control condition involving interaction with information (via an online quiz) and self-reporting of drinking behaviour were as effective as a BPI in reducing drinking.

Study Two (Chapter Three) investigated the delivery of anti- alcohol information (fear campaigns, responsible drinking messages, alcohol-related information) in the form of posters delivered in a semi-naturalistic bar-laboratory. These were compared to pro-alcohol information (POP displays). Overall the anti-alcohol posters did not have a significant effect in reducing drinking behaviour. Findings emphasised the impact a pro-drinking environment (e.g. pub) has on behaviour.

Study Three (Chapter Four) investigated the effect of alcohol unit and guideline information on drinking glasses. Specifically, Study Three showed that labelled glasses were ineffective in reducing ad libitum drinking in in pairs of social acquaintances in a bar-lab.

Study Four (Chapter Five) used focus groups to investigate these glass information findings further. Participants indicated that the glasses were unlikely to affect their drinking behaviour, supporting the findings of Study Three. The focus groups provided suggestions for alternative labels.

Studies Five and Six (Chapter Six) investigated the effect of including nutrition labels and food and exercise equivalent information on drinking glasses. Results indicated that the glasses were not effective in reducing ad libitum drinking in a bar-lab (Study Five) or changing intention to drink in an online study (Study Six). However, post-hoc findings indicated that exercise equivalent labels may encourage a reduction in female drinking.

Study Seven (Chapter Seven) investigated findings from focus groups exploring views on the nutritional labels. Overall, findings suggest they were received positively and participants indicated they could be effective, although possibly only for changing intentions.

Finally, Study Eight (Chapter Eight) investigated the effect of glass shape on drinking behaviour. This study was designed to investigate drinking speed of beer from a curved or a straight glass with pairs of social acquaintances in a semi-naturalistic bar-laboratory. Results indicated no differences in drinking speed of beer between the two glass shapes.

Overall, results of the studies in this thesis indicate that interventions delivered outside of the drinking environment that involve conscious engagement, such as

BPIs and active control conditions can reduce drinking. However, interventions delivered in the drinking setting were, generally, ineffective in changing drinking behaviour. These findings highlight the importance of understanding how context influences drinking behaviour and the need to test new interventions in drinking environments. Future research, which attempts to reduce the impact of the pro-drinking environment, in combination with interventions requiring self-monitoring and reflective engagement may be more successful in reducing harmful drinking behaviour.

# Chapter Two (Study One)

## Evaluation of a brief personalised intervention for alcohol consumption: no additional benefit beyond that produced by an active control intervention

A version of this study has been published:

Clarke, N., Field, M. & Rose, A. (2015) Evaluation of a brief personalised intervention for alcohol consumption in college students. Plos One, *10*(6), e0131229. doi: 10.1371/journal.pone.0131229

## 2.1 Abstract

Feedback interventions may help in reducing drinking behaviour. The current study examines the effect of a brief personalised feedback intervention (BPI), compared to an active control intervention, on (i) alcohol consumption (ii) the frequency of binge drinking and (iii) readiness to change (RTC). A sample of 103 students who consumed alcohol regularly completed a battery of baseline questionnaires [timeline follow-back (TLFB), readiness to change ruler (RTC) and Alcohol Use Disorders Identification Test (AUDIT)] before completing an alcohol-related quiz using the National Health Service Change4Life website. The quiz was included to encourage participants to engage with the alcohol-related information. Participants allocated to the BPI group (N=52) then received 10 minutes personalised feedback on their drinking. At follow up two weeks later, all participants repeated the questionnaire battery and attempted to recall the answers to the alcohol quiz. Results indicated that both groups significantly decreased their alcohol consumption and frequency of binge drinking but there were no significant group differences in either of these measures. There was a small but significant increase in RTC in the active control condition, but no significant interaction between the groups. Participants recalled around half of the information that they were initially exposed to, suggesting engagement with the task. Positive correlations were found between RTC ruler and AUDIT overall at baseline and follow-up, but not with the RTC and unit consumption. It was concluded that the provision of generalised information is as efficient as a BPI for the reduction of alcohol consumption in students. In this population, engaging with generalised information may be a successful harm-reduction intervention.

## 2.2 Introduction

Policies regarding the dangerous use of alcohol often focus on harm-reduction methods, defined as a pragmatic approach to reduce the negative consequences of drinking by working at an individual or community level (Marlatt & Witkiewitz, 2010). The Government's Alcohol Strategy (2012) aims to reduce the health, financial and societal burden of excessive drinking. To achieve this, current alcohol policy involves informing the public on alcohol guidelines so that, with access to information regarding the safe guidelines for consumption, each individual can remain responsible for their own drinking which should also result in an overall change in the drinking culture (Baggott, 2010). This assumes that individuals with relevant health information will act in their own best interests.

Information provision and educational alcohol harm-reduction strategies have become widespread, but their results are disappointing (Babor et al., 2010). Thadani, Huchting and LaBrie (2009) found that a two-hour intervention involving the teaching of alcohol-related knowledge resulted in greater knowledge after six months, with heavier drinkers more likely to remember information about alcohol, but the two groups did not differ in terms of their drinking. A review for the World Health Organisation (2006) evaluated 23 of the most common youth-orientated prevention programmes and concluded that many of the studies showed no significant positive effect of the intervention compared to a control (Foxcroft, 2006). A more recent review of the evidence for the efficacy of alcohol harm-reduction policies found a lack of scientific research regarding public information campaigns, with most individual studies finding such campaigns ineffective, and they emphasised a need for assessment of current policy effectiveness (Anderson et al., 2009a). In addition, a separate review of general mass media campaigns aimed at behavioural change concluded that in regards to alcohol intake, they have had little success (Wakefield et al., 2010). An example of a current mass media campaign is the NHS Change4Life 'Choose Less Booze' campaign. This was launched in 2012 and has been designed to communicate the health harms of drinking above the lower-risk guidelines and contains a range of tips and tools to encourage people to drink less (Department of Health, 2009).

One explanation for the lack of effectiveness of information-only strategies such as mass media campaigns could be that participants fail to engage with or remember the information. For example, 40-80% of medical information given is forgotten immediately, and the more information given, the lower the proportion recalled (McGuire, 1996). In a computer-delivered personalised feedback intervention it was found that recalling and writing down information led to a higher reduction of drinking after two weeks, suggesting the level of retention of feedback may increase an intervention's success (Jouriles et al., 2010). By having participants engage with and recall the information, memory of the feedback is improved, and this may make the behaviour more likely to be acted upon.

Another possible reason for the ineffectiveness of general harm-reduction strategies is that they will rarely fit the population as a whole, due to individuals having varying needs and wants. Therefore, harm-reduction policies may be more effective if personalised to the specific requirements of an individual (Martlatt & Witkiewitz, 2010). Recently, research has focused towards interventions that move away from an information-only approach, and towards brief interventions that are individualised (Worden & McCrady, 2013).

Brief personalised interventions (BPI) involve the delivery of short structured 'brief advice' to encourage risky drinkers to lower their drinking levels (Kaner et al., 2013) and their content is based on personalised information with the aim to increase an individuals' awareness of their own behaviour (Riper et al., 2009). BPIs take the form of discussions intended to change behaviour by altering views concerning the personal acceptability of damaging and excessive drinking (Dhital, Norman, Whittlesea & McCambridge, 2013). NICE alcohol use and preventing harm update recommends a BPI session should: take 5-15 minutes, cover potential harm caused by drinking, provide reasons for changing behaviour, outline barriers to change, provide strategies to help reduce alcohol consumption, and lead to a set of behavioural goals (NICE, 2010). This shows some overlap with a more recent review which identified the most important elements of BPIs as: identifying consequences that are personally relevant, highlighting the practical costs of alcohol consumption, identifying risk reduction strategies and providing normative comparisons (Miller et al., 2013). Normative information about peers' drinking can involve descriptive norms, which includes how often the respondent believes others drink (Baer, Stacy &

Laimer, 1991), and injunctive norms which involve perceptions of how acceptable drinking is to a certain group (Larimer, Turner, Mallett, Geisner, 2004b). These can be strong predictors of drinking, particularly within student populations (Larimer et al., 2004b). All of these elements were contained in a BPI evaluated by the Screening and Intervention Programme for Sensible drinking (SIPS) trial (Drummond et al., 2014). This BPI was designed to provide practitioners with a structure to deliver brief advice to hazardous and harmful drinkers with an aim to capture risky drinking at an early stage, and provide advice or counselling to help reduce consumption (Kaner et al., 2013). SIPS assessed BPI effectiveness within a primary care setting but failed to find a difference between the BPI and control groups (Drummond et al., 2014), perhaps indicating that different populations require different BPI elements.

Much of the research with personalised feedback has been carried out in student populations and the feedback is given in a variety of forms such as group meetings, face-to-face, by mail or on the Internet (Miller et al., 2013). There are mixed findings with BPI effectiveness; normative feedback delivered online has been found to reduce weekly alcohol consumption (Bewick et al., 2010; Neighbors, Lewis, Bergstrom & Larimer, 2006), and have greater effects than education only web sites (Chiauzzi, Green, Lord, Thum & Goldstein, 2005). Larimer and Cronce (2007a) confirmed these findings, showing that personalised feedback reduced drinking and negative consequences in students compared with an information-only control condition. In heavy student drinkers, individual level alcohol interventions can reduce alcohol use and problems (Carey, Carey, Maisto & Henson, 2006; Carey, Scott-Sheldon, Carey & DeMartini, 2007). Two recent reviews including the assessment of BPIs showed positive results, most were effective in reducing binge drinking (Bridges & Sharma, 2015) and decreasing alcohol-related problems and peer perception of alcohol use (Ickes et al., 2015). However, in another review of brief web-based alcohol interventions many studies did not support their efficacy and it was concluded there was no evidence to support their use (Leeman et al., 2015).

In a meta-analysis evaluating the efficacy of a broad range of interventions in first-year college students, it was concluded that those interventions containing personalised feedback enhance efficacy, particularly compared to controls which only include assessment of alcohol behaviour (Scott-Sheldon et al., 2014). However, compared to active controls (defined as brief-alternative alcohol-related

interventions, general health interventions or interventions that provide only alcohol education) alcohol interventions produced no additional benefit. It is not clear why a difference in the effectiveness of these two approaches has not been found. It is possible that the personalised nature of the BPI elements encourages engagement with the intervention, and that it is this engagement which is key. Given that such active controls should be cheaper to deliver and are less time consuming, it is important to determine whether these types of intervention really are as effective as BPIs in this population. The current study developed an alcohol-related quiz based on the Change4Life 'Choose Less Booze' website, and gave all participants 10 minutes to navigate the website to find the answers to the quiz. The quiz was included as a way of engaging the students with the active control intervention. Engagement was assessed at a two week follow-up when participants were asked to recall the quiz answers.

One additional mechanism suggested to be key in underlying drinking behaviour (Rollnick, Heather, Gold & Hall, 1992), with regards to brief interventions, is readiness to change (RTC) (Collins, Logan & Neighbors, 2010). BPIs have been found to increase RTC in hazardous student drinkers (Ostafin & Palfai, 2012) and it has been suggested that an aim of BPIs in college students should be to increase RTC (Larimer, Cronce, Lee & Kilmer, 2004b). However, a review of three studies in college students found that after controlling for treatment effects, there were no positive associations between RTC and drinking (Borsari, Murphy & Carey, 2009). Therefore this relationship is not consistently reported and more investigation is warranted.

Although personalised feedback appears to be reliably effective in the reduction of harmful alcohol use, it has been emphasised that further investigation is warranted (Miller et al., 2013), especially from non-American student populations which is where the majority of research originates. The aim of the current experiment was to compare whether alcohol-related outcomes, within UK students, differed following two interventions; the first group received an active control intervention only and the other received the active control plus a BPI. Importantly, the study encouraged engagement with provision of alcohol-related information in both groups to determine whether engagement is the key to successful interventions. It was hypothesised that, compared to the control group, a BPI would result in (i) reduced

alcohol consumption (ii) reduced frequency of binge drinking and (iii) increased readiness to change (RTC). Recall of the alcohol-related information was assessed to determine the level of engagement participants had with the information.

## 2.3 Method

### Participants

One hundred and three student social drinkers (51 female; mean age 23.85 [SD ± 3.39]) were recruited from the University of Liverpool via advertisements, word of mouth and using the university's online Experiment Participation Requirement (EPR) system. Inclusion criteria were fluency in English and weekly consumption of alcohol (mean weekly unit consumption: 25.38 [SD ± 17.91], UK alcohol unit = 25ml of a standard spirit = 8 grams of pure alcohol). All participants provided informed consent before taking part in the study and received £5 reimbursement as compensation for their time. The study was approved by the University of Liverpool Research Ethics Committee.

### Power calculation

Previous brief intervention research has found small to medium effect sizes (Moyer, Finney, Swearingen & Vergun, 2002; Riper et al., 2009]. Power calculations using GPower (Faul & Erdfelder, 1992) indicated that a sample size of 102 would detect a medium effect size (Cohen's d = 0.5, with power (1—β) set at 0.80 and α = 05).

### Design

The study was a between subjects design. Participants were randomly allocated (stratified by gender) to the BPI group (personalised feedback on their alcohol use with alcohol-related information) or the active control group.

### Questionnaire Measures

*Alcohol Use Disorders Identification Test (AUDIT, see Appendix 1)* (Saunders, Aasland, Babor, De la Fuente & Grant, 1993). The AUDIT is a clinical screening tool designed to pick up the early signs of hazardous drinking (Babor, Higgins-Biddle, Saunders & Monteiro, 2001). The AUDIT is a ten-item scale, the first three

questions relate to quantity and frequency of alcohol use, and the remaining seven questions assess behaviours associated with drinking and its consequences. Each item on the AUDIT is scored from 0-4, giving a total possible score of 40. According to WHO guidelines (Saunders et al., 1993), scores of 8 or above are indicative of hazardous or harmful use (with a risk of dependence, a clinical condition defined by specific diagnostic criteria in the DSM 5 [NIH, 2013]) and scores of >20 suggest increased risk of dependence. Cut offs can also be used to determine the most suitable type of intervention, for example between 8 and 15 represents medium risks of alcohol problems, and simple advice is suggested as an intervention (Babor et al., 2001).

When used in college students the AUDIT has been shown to have good internal consistency as a single factor (Cronbach's alpha = 0.82; Shields, Guttmannova & Caruso, 2004) and high test-retest reliability (Dybek et al., 2006). It is an effective tool to measure risky drinking and has been shown to surpass other alcohol screening methods (Allen, Reinert & Volk, 2001.

*Timeline Follow Back Questionnaire (TLFB, see Appendix 2*) (Sobell & Sobell, 1992). The TLFB is a self-report measure which estimates fortnightly alcohol consumption in UK units. Participants retrospectively record the number of units consumed over the preceding two weeks on a day-to-day basis up until the night before the experimental session. Participants could use diaries to assist in recall (e.g. to note down particular events which may have included drinking alcohol). Outcome measures are weekly alcohol unit consumption and weekly binge frequency (binge defined as: ≥8 units p/drinking episode in men, ≥6 units p/drinking episode in women [NICE, 2010]).

The TLFB has been shown to be as reliable as interview methods (Hoeppner, Stout, Jackson & Barnett, 2010) and is an efficient way to assess quantity and frequency of alcohol consumption in both problem and social drinkers. It can be used to examine drinking patterns over a longer period of time, for example with a 30-day diary (Henges & Marczinski, 2012) or up to 12 months (Sobell & Sobell, 1992). However, in social drinkers long recalls can be inaccurate (Hoeppner et al., 2010), therefore two weeks is more accurate and a sufficient period to obtain typical drinking patterns.

The correlation coefficients range from 0.75 to >0.90 (Cohen & Vinson, 1995; Sobell, Sobell, Klajner, Paven & Basian, 1986) for shorter TLFBs (>4 weeks) in both dependent and non-dependent samples, showing a relatively high test-retest reliability.

*Readiness to change contemplation ruler (RTC ruler, see Appendix 3)* (LaBrie, Guinian, Schiffman & Earleywine., 2005). A key mechanism suggested to underlie drinking behaviour (Rollnick et al., 1992) is readiness to change (RTC) (Collins et al., 2010). This is a measure of the motivation to change a desired behaviour and is based on the transtheoretical model of behaviour change, which suggests individuals move through a series of stages when changing behaviour (Prochaska & DiClemente, 1986).

A frequently used measure of the stage of change reached by an excessive drinker is the readiness to change questionnaire (RTCQ) (Rollnick et al., 1992), this assigns an individual to one of three stages: precontemplation, contemplation and action. However, a quicker and simpler way to represent readiness to change is along a continuum. The contemplation ruler is a single item continuum originally developed for smoking cessation (Biener & Abrams, 1991) and versions of the ruler have been developed for use in substance use (Carey, Carey, Maisto & Purnine, 2002). Participants self-report their intention to change their behaviour on the continuum, and verbal anchors help participants assess their own level of readiness to change. The ruler is a scale from 0 to 10, with 0 representing the statement 'I never think about my drinking', and 10 representing the statement 'my drinking has changed. I now drink less than before'. Participants are required to circle the number that best describes how they feel.

Progress along the change continuum is said to be an important aspect of a successful intervention even if it does not immediately produce the desired behavioural change (Prochaska & DiClemente, 1992). The single-item ruler is highly correlated with the multiple-item RTC questionnaire ($r = 0.77$), and the ruler is suggested to be a better predictor of behavioural intentions than the RTCQ (LaBrie et al., 2005).

Materials

*Active Control (see Appendix 4)*: All participants completed the active control and were required to interact with the alcohol section ('Choose Less Booze') of the Change4Life website (http://www.nhs.uk/Change4Life) to find the information needed to complete a quiz. The quiz comprised ten questions related to alcohol guidelines, health risks and methods to reduce drinking. Participants were given a maximum of 15 minutes to complete the quiz, and the time taken to complete it was recorded.

The task was designed to provide participants with alcohol-related information and harm-reduction techniques and to maximise engagement with the information. The control condition can be described as an active control as it contained assessment of drinking habits and the provision of alcohol-related information in an engaging task. In a recent meta-analysis active controls are defined as brief-alternative alcohol-related interventions, general health interventions or interventions that provide only alcohol education (Scott-Sheldon et al., 2014)

*Brief Personalised Intervention (BPI, see Appendix 5):* Participants in the experimental group were given a BPI regarding their alcohol use (in addition to the quiz) to encourage them to lower their drinking levels. The BPI involved a brief advice tool used in the SIPS alcohol screening and brief intervention (ASBI) research programme (Drummond et al., 2014), which was funded by the UK Department of Health (2009) as part of the national Alcohol Harm Reduction Strategy for England (2004). This Brief Advice tool 'Brief advice about alcohol risk' was based on a Simple Structured Advice intervention tool 'How much is too much?' which was used in the UK version of the Drink-Less Brief Intervention programme (McAvoy, Kaner, Haighton, Heather & Gilvarry, 1997) from a World Health Organisation investigation on screening and brief interventions (Centre for Drug and Alcohol Studies, 1993).

Participants received ten minutes personalised feedback on their alcohol use (based on their TLFB and AUDIT data) in the form of face-to-face advice and a two-page leaflet. The advice and content of the leaflet involved assignment of participants to a drinking risk category (lower-risk, increased-risk, and high-risk) based on government guidelines (Edwards, 1996) and information about the health and social

consequences of belonging to each of these groups. Participants were shown a sex specific graph, which indicated that those in the increased and high-risk groups had drinking levels that exceeded the average for the population. They were also shown a list of benefits that would result from reduced drinking, advised about techniques that could help them to reduce their drinking, and provided with a personalised drinking reduction target. Therefore, this BPI includes all the elements that Miller and colleagues (2013) highlighted as effective BPI components: identifying consequences that are personally relevant, highlighting the practical costs of alcohol consumption, identifying risk reduction strategies and providing normative comparisons.

Outcome Measures

*Follow-up Tasks*: At a two week follow-up, all participants were given the questionnaire battery for a second time (TLFB, AUDIT, RTC) and were required to recall the answers to the quiz questions. This helped to determine how well the alcohol harm-reduction information was retained, which gives an indication of level of engagement with the task, and whether there was any difference in information recall across conditions.

Procedure

Testing sessions took place between 9am and 6pm in a laboratory in the School of Psychology.

Upon arriving in the lab participants were given an information sheet, provided written informed consent and completed the questionnaire battery on alcohol use and consumption, and readiness to change (TLFB, AUDIT, RTC). All participants then interacted with the alcohol section of the Change4Life website, and they were informed that they had a maximum of 15 minutes to find the information needed to answer the ten alcohol-related questions in the quiz. While the participant was completing the computer task the researcher calculated the participants' drinking levels and AUDIT score and categorised them as low-/increased-/high-risk drinkers. Those in the active control group were then free to leave. Those in the BPI group were given ten minutes brief advice, in the form of face-to-face personalised

feedback (based on average units and AUDIT scores) and the two-page leaflet which they were given to take away.

*Follow-up*: All participants returned two weeks later. They completed the questionnaire battery (TLFB, AUDIT, RTC) before being given 15 minutes to complete the alcohol quiz as a cued recall task (without access to the Change4Life website). Participants were then fully debriefed before being discharged.

### 2.4 Results

Distribution of data was analysed and skewed variables were transformed to allow for parametric testing. There was one dropout in the control condition, who did not differ on baseline characteristics.

Participant Characteristics

Descriptive statistics are presented in table 2.1. MANOVA indicated groups did not statistically differ on any of these factors (ps > 0.39). The sample was made up of 88.35% risky drinkers, identified by an AUDIT score of 8 or above (Babor et al., 2001). Groups did not differ in percentage of risky drinkers, [$\chi^2$ (1, $N$ = 103) =0.42, p = 0.52]. The mean score on the RTC ruler was 3.71 (SD ±2.36) this score lies between ‘sometimes I think about drinking less’ and ‘I have decided to drink less’.

**Table 2.1. Means (±SD) for participant characteristics by condition (N=103)**

| | *Mean scores(±SD)* | | | *Statistics (MANOVA)* | |
|---|---|---|---|---|---|
| | *Intervention (52)* *Female (28)* *Male (24)* | *Control (51)* *Female (23)* *Male (28)* | *Overall (103)* *Female (51)* *Male (52)* | | |
| Variable | | | | *F* | *p* |
| Age (y) | 23.63 (3.28) | 24.08 (3.50) | 23.85 (3.39) | 0.44 | 0.51 |
| RTC ruler (1-10) | 3.56 (2.12) | 3.87 (2.62) | 3.71 (2.36) | 0.21 | 0.64 |
| AUDIT (0-40) | 14.04 (5.54) | 13.63 (5.36) | 13.9 (5.46) | 1.15 | 0.70 |
| Weekly consumption (TLFB) (units) | 26.37 (16.03) | 24.38(19.76) | 25.52 (17.88) | 0.75 | 0.39 |
| Weekly binge (units) | 1.53 (1.05) | 1.51 (1.23) | 1.52 (1.13) | 0.04 | 0.84 |

TLFB = Time Line Follow Back; AUDIT = Alcohol Use Disorders Identification Test; RTC ruler: Readiness to Change Ruler; Weekly binge = number of binge drinking episodes per week

Weekly alcohol consumption and weekly binge

To assess whether alcohol consumption changed over time and/or by condition a mixed 2 x 2 ANOVA was conducted for weekly unit consumption and weekly binge (two within levels of time: baseline, post follow-up; between factor: condition).

The analysis of alcohol consumption (see figure 2.1) revealed a significant main effect of time, [$F(1, 101) = 18.52$, $p = 0.001$, $\eta p^2 = 0.16$], with alcohol consumption decreasing significantly in both the BPI group, [$t(1, 51) = 3.24$, $p = 0.002$] and the control group [$t(1, 50) = 2.85$, $p = 0.006$]. The main effect of group, [$F(1, 101) = 0.48$, $p = 0.49$] and the group x time interaction, [$F(1, 101) = 0.03$, $p = 0.86$], were not statistically significant. Independent post-hoc t-tests found no significant differences in weekly unit consumption between the groups at baseline or follow-up.

Therefore, alcohol consumption decreased significantly in both the BPI and the active control group.

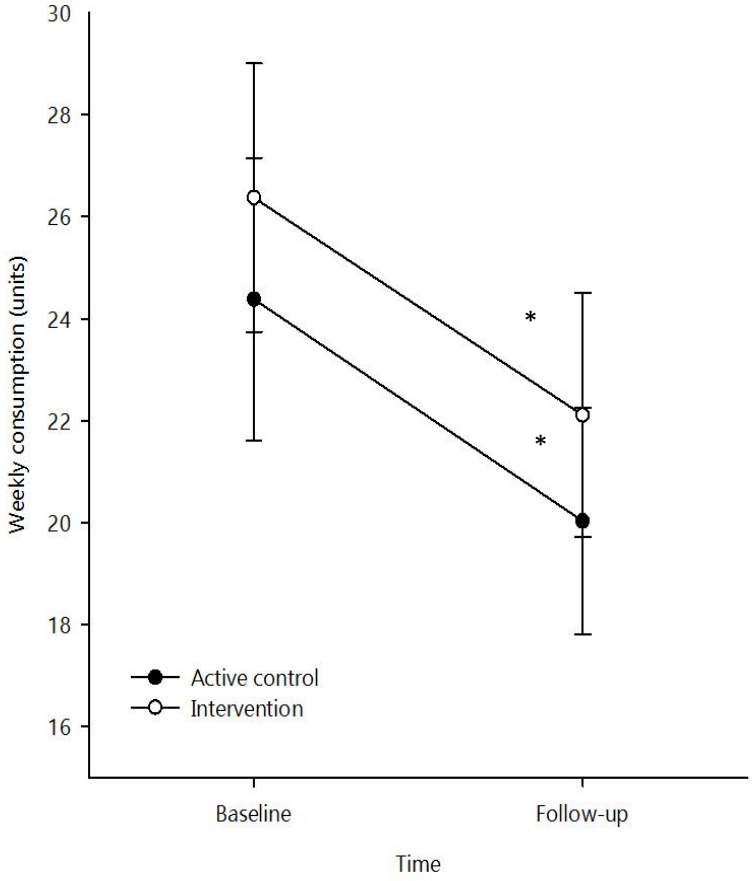



*Figure 2.1. Weekly unit consumption at baseline and follow-up by condition. Error bars represent SE of the mean. *Significant difference from baseline within-condition, p <0.05*

The analysis of binge frequency revealed an identical pattern (see figure 2.2). There was a significant main effect of time, [F (1, 101) = 11.50, p = 0.001, $\eta p^2$= 0.10], with binge frequency decreasing in both the BPI group, [t (1, 51) = -2.41, p = 0.02] and the control group, [t (1, 50) = 2.75, p = 0.01]. The main effect of group, [F (1, 101) = 0.38, p = 0.53] and the group x time interaction, [F (1, 101) = 0.23, p = 0.63] were not statistically significant. Independent post-hoc t-tests found no significant differences in weekly unit consumption between the groups at baseline or follow-up.

Therefore, binge frequency decreased significantly in both the BPI group and the active control group.

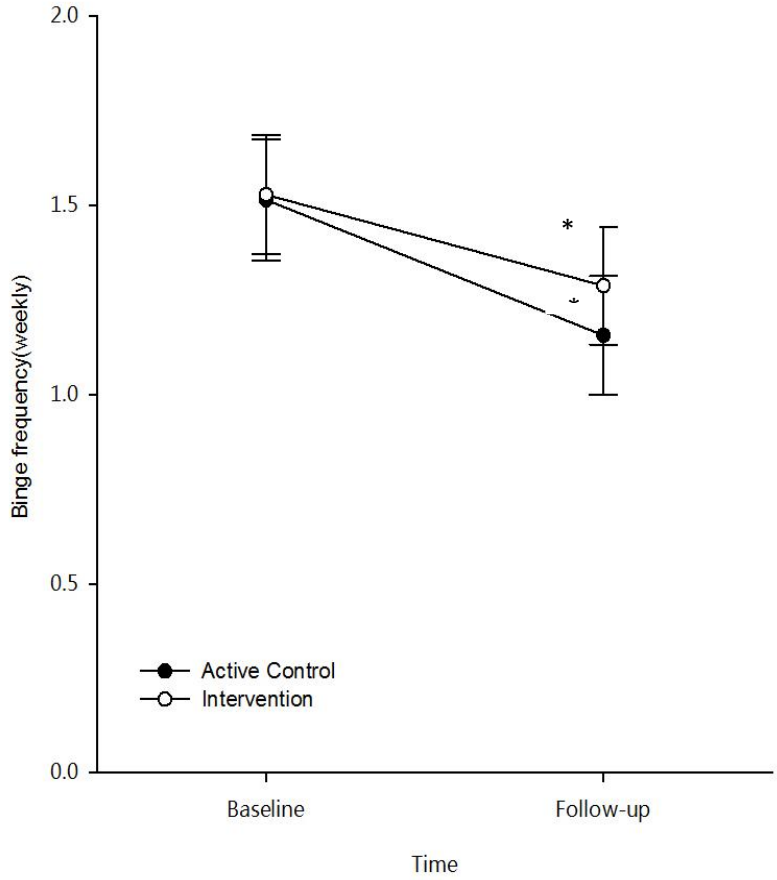



*Figure 2.2. Weekly binge at baseline and follow-up by condition. Error bars represent SE of the mean. *Significant difference from baseline within-condition, p <0.05*

Readiness to Change

The analysis of RTC ruler scores (see figure 2.3) revealed a significant main effect of time, [F (1, 101) = 5.7, p = 0.02, $\eta p^2 = 0.05$], although post-hoc t-tests indicated that the RTC increased between baseline and follow-up in the active control group, [t (1, 51) = 2.05, p = 0.05], but not the BPI group, [t (1, 51) = -0.97, p = 0.34]. However,

the main effect of group, [F (1, 101) = 1.38, p = 0.24], and the group x time interaction, [F (1, 101) = 1.06, p = 0.30], were not statistically significant.

Therefore, RTC increased significantly in the active control group.

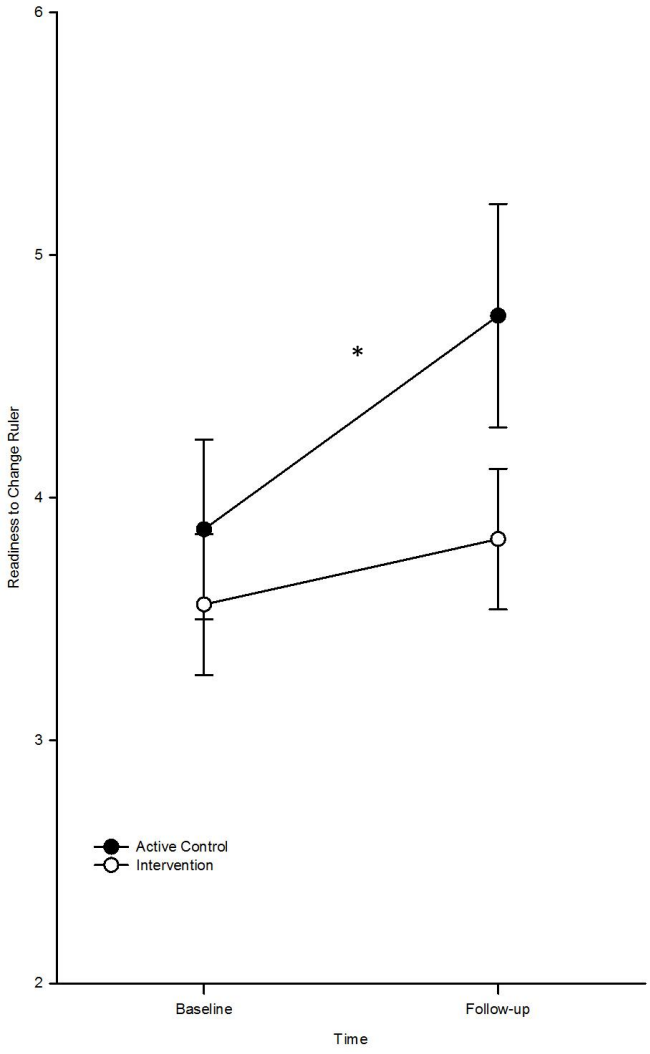



*Figure 2.3. RTC ruler at baseline and follow-up by condition. Error bars represent SE of the mean. *Significant difference from baseline within-condition, p<0.05*

Experimental Task

One-Way ANOVA determined whether time taken to complete the alcohol quiz (session 1) or recall the answers to the quiz (session 2) differed by group. There were no significant differences for the time taken to complete the quiz, p = 0.91, or

significant differences in recall between groups, p = 0.36. Overall, participants had an average information recall of 50% (ranging from 0-100%).

Table 2.2 shows the percentages of correct answers recalled correctly by condition (see Appendix 6 for a visual representation). Chi-squared tests were used to identify significant differences between the two percentages for each question. There were no significant differences between the groups on any question, *ps* ≥ 0.19.

**Table 2.2. Percentages for the correct recall of questions, by condition**

| *Question* | *% correct intervention* | *% correct control* | $\chi^2$ (df=1) | *p value* |
|---|---|---|---|---|
| 1. Units in 1 glass of red wine | 42.00 | 53.00 | 1.17 | 0.28 |
| 2. Daily recommended allowance for a male | 52.00 | 65.00 | 1.26 | 0.26 |
| 3. Calories in 3 pints of beer | 21.00 | 16.00 | 0.90 | 0.34 |
| 4. Millilitres in a small glass of wine | 48.00 | 63.00 | 1.70 | 0.19 |
| 5. Recommended booze free days a week | 58.00 | 45.00 | 1.64 | 0.20 |
| 6. Mouth cancer risk | 29.00 | 37.00 | 0.82 | 0.36 |
| 7. Daily recommended allowance for a female | 63.00 | 34.00 | 0.12 | 0.73 |
| 8. Increased risk of liver cirrhosis | 2.00 | 2.00 | 1.00 | 0.32 |
| 9. Two ways to drink less on a night out | 71.00 | 80.00 | 0.77 | 0.38 |
| 10. Two possible ways to 'pace yourself' | 81.00 | 76.00 | 0.61 | 0.43 |

## Correlations

### *RTC ruler and alcohol habits*

Correlational analysis (separated by group) assessed the relationship between measures of alcohol use and RTC ruler scores. A p-value of 0.01 was used to correct for multiple comparisons.

In the BPI group a positive correlation was found between RTC ruler and AUDIT at baseline, *r* = 0.36, p = 0.01, but not follow-up. This shows that those with higher self-reported alcohol problems demonstrated increased readiness to change at baseline. In the active control there were no significant correlations between RTC ruler and alcohol habits.

*Experimental task and alcohol habits*

Correlational analysis (separated by group) between the computer task measures (correct answers, time taken) and the alcohol measures (RTC ruler, AUDIT, fortnightly unit consumption, weekly binge, TLFB change score) were carried out to investigate any effects of the group interventions on information retention and change in alcohol habits. A p-value of 0.01 was used to correct for multiple comparisons. No significant correlations were found.

Further analysis revealed no significant differences between the magnitude of the differences between groups for the TLFB and time taken to do the computer task, or the correct responses on the recall task and TLFB change score.

## 2.5 Discussion

The present study examined the effect of a BPI on weekly alcohol consumption and binge frequency and readiness to change, compared to an active control. It was found that both groups significantly decreased their alcohol consumption and weekly binges to a similar extent. The active control showed small but significant increases in scores on the RTC ruler, but there was no interaction. There were no significant differences between groups in the recall of information at follow-up; both groups remembered around half of the alcohol quiz answers.

The finding that both groups decreased their alcohol consumption significantly and by a similar amount suggests that the BPI offers no additional benefit to the active control condition, and this may be due to specific components of this condition. The active control condition contained a screening component, as it involved the assessment of the quantity, frequency and consequences of the participants' drinking through self-reports (Dimeff, Baer, Kivlahan & Marlatt, 1999). Effects from assessment-only control groups is not a new phenomenon; reactivity has received attention throughout the literature due to unanticipated improvements in control groups over time (McCambridge & Day, 2008). Small effects on AUDIT scores and weekly alcohol consumption have been found across 10 studies in a meta-analysis on answering questions on drinking behaviour (drinking diaries and the AUDIT questionnaire) in brief interventions (McCambridge & Kypri, 2011). Another systematic review of 26 studies found that unobserved reductions in drinking in

control groups have been repeatedly identified (Jenkins, McAlaney & McCambridge, 2009).

Studies looking specifically at the effect of screening compared to non-screening have found that giving a brief intervention with a drinking diary (timeline follow-back) has more of an effect one month later compared with not including a drink diary (Carey et al., 2006), suggesting the diary provides an additional component to the intervention. McCambridge and Day (2008) compared screening to a non-screened group and found significant differences (similar to the known effects of BPIs) on measures of hazardous drinking. In heavy drinking college students, assessing their drinking behaviour at three, six and twelve months resulted in a significant reduction of risky behaviour, including risky drinking, compared to a delayed assessment at 12 months (Walters, Vader, Harris & Jouriles, 2009). Furthermore qualitative accounts from clients in alcohol treatments suggest that research pre-treatment assessments were an important component of the treatment; with a motivating influence and an impact on actual behaviour change (Orford et al., 2006). Although it is often necessary to take baseline measures, future research needs to take the impact of these initial assessments into account when trying to isolate the specific influence of the intervention.

The current study found almost identical reductions in alcohol consumption, yet most studies assessing screening-only effects have found smaller effects to that of BPIs. Most general information harm-reduction strategies simply provide individuals with various facts about alcohol and its harms. However, an important aspect of our study was that we encouraged engagement with the information-only component of the interventions by asking the participants to use the information to complete a quiz. The combination of the education and drinking assessment formed an active control condition. This supports previous findings that BPIs compared with active comparison conditions (such as alcohol education only, or general health information) produce no additional benefit (Kaner et al., 2013; Scott-Sheldon et al., 2014). With a primary care population, at two follow up points, a BPI or brief lifestyle counselling did not produce any additional benefit in reducing harmful drinking compared with screening and the provision of an information leaflet (Kaner et al., 2013). Due to the changes in the control condition being similar to that of the brief intervention reduction, it was concluded that the conditions contained similar

active factors of behaviour change (Abraham & Michie, 2008). Therefore there may be components in active control groups that work by similar mechanisms as BPIs, and greater insight is required to understand what components of these interventions are necessary for behaviour change.

This highlights that although information-only strategies are often ineffective (Wakefield et al., 2010), it is possible that they can be efficacious if engagement is maximised (Jouriles et al., 2010). Information-only strategies are cheaper than BPIs (WHO, 2009), thus if we are to continue investing in information-only strategies, future research should identify ways to maximise engagement with the information. Our recall level at follow-up for both groups was approximately 50% which is significantly higher than that found by others (e.g. 10%) (Jouriles et al., 2010). This suggests that quizzes may be one effective engagement strategy and further investigation into the possible delivery method is warranted.

Another potential explanation for behaviour change in BPIs and control conditions (information provision and screening) in BPI studies is that both act upon the self-regulation of behaviour (McCambridge & Kypri, 2011). The process of reporting one's own behaviour may result in reflecting and a consequent change in behaviour. A possible mechanism suggested is that an awareness of risky drinking results from the assessment of drinking behaviour. This awareness may initiate self-monitoring and lead to recognition of an inconsistency between current behaviour and a personal standard. This may impel a need for change in the individual and consequently alter behaviour to be more in line with their own self-concept (Moos, 2008). From a reflective-impulsive account of behaviour change, self-monitoring and self-regulation involves engagement with the reflective system for successful behaviour change (Quigley, 2013). In a drinking environment the reflective system can be difficult to engage, and often impulsive impulses may override it (Liu et al., 2014). Although changes in drinking behaviour were found in this study at two-week follow-up, it would be of interest to investigate whether this intervention can be effective when met with the influences of a drinking environment. Future research should record participants' engagement with drinking situations and establishments to determine whether these forms of intervention have a beneficial effect in a drinking environment or whether such environments are avoided.

In terms of RTC, it was hypothesised that the intervention would increase scores. However, there was no increase in the BPI group and there was no difference in RTC scores across groups. Furthermore, there was a positive correlation in the BPI group with RTC and AUDIT, but no significant correlations between alcohol use and RTC. There have been mixed results with regards to interventions, alcohol use and motivation amongst students (Shealy, Murphy, Borsari & Correia, 2007) with little success in regards to increases in RTC (Fromme & Corbin, 2004; Schaus, Sole, McCoy, Mullett & O'Brien, 2009). Support for the relationship between alcohol use and RTC has been shown to vary depending on specific aspects of the assessment, such as timing or the instrument used to measure RTC (Carey, Purnine, Maisto & Carey, 1999). Evidence suggests that there is a non-linear relationship between alcohol use and RTC, as high levels of drinking are shown in those who show moderate levels of RTC, and low levels of drinking in those with high or low RTC (Cadigan, Martens, Arterberry, Smith & Murphy, 2013). Therefore the relationship is not simple, and high levels of alcohol use do not necessarily correlate with high or low RTC. A high variability on the RTC ruler both within and between individuals has also been found in previous research, with fluctuating alcohol consumption rates and scores on the ruler (Kaysen, Lee, LaBrie & Tollison, 2009). Taken together, research suggests RTC is a phenomenon difficult to measure and its relationship with alcohol is complex. Again, the absence of consistent findings in student drinkers indicates the RTC construct is of less importance for non-treatment seeking individuals (Collins et al., 2010)

There are several points that need to be highlighted in terms of limitations and research recommendations. Firstly, most BPI research implements a screening method to identify risky drinking before the intervention is administered, whereas the current study employed a universal approach. In Miller and colleague's (2013) review of 41 studies into personalised feedback interventions for alcohol misuse only one study used this approach, recruiting all students regardless of drinking status (Larimer et al., 2007b). It may be that the minority of drinkers in the current study whose consumption is not 'risky' may not benefit from a face-to-face intervention and for that reason future investigation could employ a validated screening method. Nevertheless, a large group of abstinent students were included in the universal feedback intervention previously mentioned (Larimer et al., 2007b) and abstainers

receiving the intervention were twice as likely to remain abstinent after one year as those in the control. In the current study, inclusion criteria ensured there were no abstainers, but this indicates that even in lower-risk drinkers feedback can still function as a preventative measure and is worthy of future investigation.

Secondly, the follow-up period of two weeks is a moderately short period to examine changes in drinking behaviour; therefore, conclusions regarding long-term effects cannot be drawn. Although many brief interventions can be effective in the short term, the duration of this outcome is difficult to determine (Miller et al., 2013) with many studies demonstrating that drinking reduction effects diminish over time (e.g. Carey et al., 2007; Carey, Carey, Maisto & Henson, 2009). However, due to the interest in memory for the recall task in the current study, a longer-term assessment would not have been feasible as memory declines rapidly (Meeter, Murre & Janssen, 2005). A further weakness with the short-term nature of this study is that it may fail to capture accurate drinking levels. Past research has shown that students display a fluctuating pattern of drinking, with it varying week to week (due to exam periods and holidays), thus reports on the previous fortnight are likely to vary depending on when the data is collected (Del Boca, Darkes, Greenbaum & Goldman, 2004). While the current study avoided testing during exam periods, this reinforces the need for a longer period of assessment in addition to the short-term follow-up to fully capture the ability of interventions to reduce drinking.

Given the risky drinking behaviour of this population, effective, evidence-based polices on alcohol harm-reduction strategies are needed. Importantly, the current study demonstrates that in a UK student population a BPI offers no additional benefit to an active control at reducing alcohol consumption over a short time period. The active control, which involved a drinking assessment and the engagement with alcohol-related information, was as effective as a BPI in reducing alcohol-related behaviour. Notably, active controls are arguably more cost effective than traditional BPIs which require more time and effort. However, if information-only interventions are suitable in this population, the next step would be to identify the best way to engage students in these strategies.

# Chapter Three (Study Two)

## Can anti- and pro- alcohol drinking messages influence environmental effects on drinking behaviour?

### 3.1 Abstract

Health campaigns use messages that encourage responsible drinking by providing information or provoking fear. These can be presented in an environment alongside messages or cues that promote alcohol. The current study examines attention to anti- and pro-alcohol messages in a bar-laboratory and their effect on motivation to drink alcohol. A sample of 60 social drinkers attended two sessions (alcohol/placebo). In the first session only, self-reported drinking habits and susceptibility to advertising were measured. In a neutral lab baseline measures of motivation to drink were taken (alcohol urge, choice, demand) before participants consumed 0.6g/kg of alcohol or placebo (within subject factor, order counterbalanced). Participants were moved to the bar-lab and randomised to one of three poster conditions; anti-alcohol messages, pro-alcohol messages or a control condition (between subject factor). Attention (dwell time) to the posters was measured during a 10 minute rest period using mobile eye-tracking before motivation to drink was measured again. Results indicated that there were no differences between poster conditions in terms of motivation to drink or attention to the posters. It is concluded that, in the current population, specific anti- or pro- alcohol marketing messages do not influence motivation to drink when presented in a typical drinking environment. This study emphasises the importance of assessing interventions in such environments and highlights the influence of a bar-laboratory context and alcohol administration on motivation to drink.

## 3.2 Introduction

Public health campaigns involve methods which aim to educate individuals on the potential harms of alcohol (Martlatt & Witkiewitz, 2010b) and the overall aim is the successful self-regulation of health behaviour (Baggott, 2010). Drinking campaigns may involve different types of information, such as fear evoking messages, which show vivid and disturbing representations of the consequences of unhealthy behaviours to create negative emotion in an individual (Brown & Locker, 2009), or information on how to drink in a responsible manner (e.g. 'Drink Responsibly' campaigns [Department of Health, 2010]). Educational campaigns are often promoted by the industry and government, for example the Government's Alcohol Strategy (2012) emphasises information provision and in the UK Government's Public Health Responsibility Deal (2010), one of the core commitments is encouraging responsible drinking.

Responsible drinking campaigns have been shown to increase alcohol-related knowledge (Kalsher et al., 1993; Fenaughty & MacKinnon, 1993) and lead to greater intentions to drink responsibly (York et al., 2012). However, giving health-related information has also been suggested to have little impact on actual drinking behaviour (Anderson et al., 2009a; Wakefield et al., 2010) and some health messages have been shown to increase consumption among undergraduate students (Moss et al., 2015). There are often higher rates of drinking in populations who have a high level of alcohol-related harm and drinking guideline knowledge, for example in medical students (Moss, Dyer & Albery, 2009), suggesting knowledge does not necessarily mean successful regulation. Evaluation campaigns that use fear evoking messages have shown mixed outcomes; a recent meta-analysis found inconsistency in results regarding the effectiveness of threatening communication in changing behaviour (Peters et al., 2013). In students, exposure to emotive anti-alcohol messages, such as unsettling medical images, produced lower estimates of the risk of alcohol compared to less emotive messages, such as images of intoxicated drinkers and diagrammatic representations of disease (Brown & Locker, 2009).

One reason given for the mixed findings in regards to drinking campaigns is that the messages may trigger defensive responses. For example, by avoidance of the message, supported by shorter inspection times to an emotive message (Brown &

Locker, 2009) and responsible drinking messages (Moss et al., 2015). Alternatively, the information may make the target behaviour more salient and therefore increase the likelihood of it occurring (Ringold, 2002). Furthermore, health campaigns are delivered in a variety of ways, such as around campuses (e.g. Kalsher et al., 1993) or online (e.g. York et al., 2012), leading to difficulty in assessing their direct effectiveness, as changes in drinking behaviour may be due to other factors. More controlled studies are often carried out in sterile lab settings (e.g. MacKinnon & Lapin, 1998), which do not reflect a normal drinking environment. This variability in the delivery of public health campaigns could explain the diversity in results. Consequently it is important to examine the impact of drinking campaign messages in a typical drinking environment, where alcohol is available and individuals are drinking.

In the real world health messages are generally overshadowed by alcohol marketing strategies (Wakefield et al., 2010), a higher exposure to which can make individuals (specifically younger drinkers [Babor, Jernigan, Brookes & Brown, 2017]) more likely to initiate or increase their drinking (Anderson et al., 2009b). This may be due to their ability to shape positive attitudes about alcohol (Austin, Chen & Grube, 2006). For example, drink promotions have been shown to increase intentions and expectations to consume alcohol in binge drinkers (Christie et al., 2001) and when individuals are exposed to positive portrayals of drinking alcohol, they are more likely to mimic this behaviour to try and reap the same rewards (Ahn et al., 2011). Therefore, when health information is displayed alongside pro-alcohol messages this results in conflicting messages and is likely to lead to conflict within an individual, potentially leading to an avoidance of the anti-drinking messages. One study measuring visual attention to cigarette packet warnings showed that participants had a preference for branding and actively avoided health warnings (Maynard et al., 2014). This suggests that when health messages are given alongside brand information individuals may show increased attention towards these cues, and decreased attention to the health information.

A bar environment contains a range of alcohol-related cues and is a context in which alcohol is consumed and individuals are often intoxicated. Research carried out in bar-like environments shows the influence such a context has on drinking behaviour. The ability to refuse alcohol when offered is lower in a bar-laboratory compared to a

lecture environment (Monk & Heim, 2013b). A bar context is associated with increased accessibility of alcohol cognitions; quicker reaction times have been found when responding to an alcohol expectancy questionnaire in a naturalistic bar compared to a neutral setting (Wall et al., 2001). Furthermore, a bar-lab leads to better memory for alcohol-related associations, suggesting it can act as an implicit cue, and can also increase alcohol consumption (Lau-Barraco & Dunn, 2009).

Given that drinkers maybe exposed to alcohol campaigns and advertisements when they are intoxicated, it is important to understand the effect of fear based and responsible drinking messages after the consumption of alcohol. Alcohol priming is the enhanced urge, or motivation, to consume alcohol as a result of initial alcohol consumption (Rose & Duka, 2007). For example, a moderate dose (0.6g/kg) of alcohol can increase choice of alcoholic drinks and self-reported desire for alcohol (Rose & Duka, 2006; Rose & Grunsell, 2008). Intoxication is associated with an attentional bias for alcohol cues in the environment. This is suggested to be due to an associative pairing between alcohol effects and alcohol cues which develop and acquire incentive salience (Berridge & Robinson, 1998), increasing the likelihood that drinkers will attend to the cues (Wiers et al., 2010). It has been suggested that alcohol's priming effect on drinking behaviour may be mediated by the effect of alcohol on attentional biases; individuals may want to consume more alcohol after a priming dose, as alcohol increases attentional biases towards alcohol-related cues. It is proposed that consuming alcohol makes alcohol cues more salient whilst also reducing an individuals' ability to inhibit their responding (making it harder to control their consumption) and this leads to alcohol-seeking behaviour (Field et al., 2010). For example, it has been found that individuals who show a large increase in attentional bias after consuming alcohol will show the largest increase in alcohol-seeking behaviours after receiving an alcohol dose (Field & Cox, 2008) and research with students has shown that alcohol-related attentional biases predict drinking (Fadardi & Cox, 2009).

The aim of the current study was to investigate the effect of anti- and pro- alcohol posters on motivation to drink in a bar-laboratory, after an alcohol or placebo drink, compared with neutral posters (control). Attention to posters was measured using mobile eye tracking glasses. Motivation for alcohol was measured using the alcohol urge questionnaire (AUQ), the alcohol purchase task (APT) which measures demand

for alcohol, and a hypothetical alcohol choice task. It was hypothesised that, in a bar-lab, anti-alcohol posters would lead to decreased motivation for alcohol and pro-alcohol posters would lead to increased motivation for alcohol, compared to the control condition. It was hypothesised that in the alcohol condition there would be an increase in motivation compared to placebo across all poster conditions due to intoxication effects. Therefore after alcohol the increase in motivation in the pro-alcohol condition would be higher and the decrease in the anti-alcohol condition would be lower, compared to the placebo condition. It was also hypothesised that there would be increased attention to pro-alcohol posters after an alcohol dose (due to intoxication increasing attentional bias for alcohol-related cues) and decreased attention to anti-alcohol posters (due to an avoidance response after intoxication), compared to a placebo dose, and that this would be associated with changes in motivation to drink.

### 3.3 Method

Participants

Sixty participants (28 female; mean age 24.51 [SD ±5.65]) were recruited from the University of Liverpool via advertisements, word of mouth and using the university's online EPR system. Inclusion criteria were fluency in English and weekly consumption of alcohol (mean weekly unit consumption: 18.61 [SD ±9.41], UK alcohol unit = 25ml of a standard spirit = 8 grams of pure alcohol). All participants provided informed consent before taking part in the study and received £5 reimbursement as compensation for their time. The study was approved by the University of Liverpool Research Ethics Committee.

Power calculation

Power calculations using GPower (Faul & Erdfelder, 1992) indicated that a sample size of 60 would detect between a medium (Cohen's f = 0.25) and large effect (Cohen's f = 0.4), with power (1—β) set at 0.80 and α = 05.

Design

The study was a within subject design (placebo/alcohol) with participants randomly allocated (stratified by gender) to a between subject condition of poster type (anti/pro/neutral).

Motivation to drink (choice/urge/demand) was measured in a neutral lab environment at baseline, before participants consumed a placebo or priming dose of alcohol (0.6g/kg) (2 drink conditions, within subject factor). Participants were moved to the bar-lab which included either anti-alcohol, pro-alcohol or neutral (music) posters (3 poster conditions, between subject factor). Participants' attention was measured during a ten minute rest period and during a second assessment of alcohol urge, choice and demand.

Questionnaire Measures

*Susceptibility to Advertising Questionnaire (STA, see Appendix 7)* (Barr & Kellaris, 2000). The STA questionnaire contains six scale items which measure the extent to which individuals attend to and value advertisements as sources of information for guiding their consumptive behaviours (Moore & Moschis, 1978). The STA questionnaire has been shown to have construct validity, unidimensionality and reliability (alpha = 0.76) (Barr & Kellaris, 2000).

*Alcohol Use Disorders Identification Test (AUDIT, see Appendix 1 and page 32 for a full description)* (Saunders et al., 1993). The AUDIT is a clinical screening tool designed to pick up the early signs of hazardous drinking (Babor et al., 2001).

*Timeline Follow Back Questonnaire (TLFB, see Appendix 2 and page 33 for a full description)* (Sobell & Sobell, 1992). The TLFB is a self-report measure which estimates weekly alcohol consumption in UK units and binge frequency (binge defined as: ≥8 units p/drinking episode in men, ≥6 units p/drinking episode in women [NICE, 2010]).

Materials

*Eye tracking.* Attention to the bar-lab areas of interest (AOIs) was measured using mobile Tobii eye tracking glasses (sampling rate 30 Hz, Tobii Glasses, Danderyd, Sweden). Data processing utilised the Tobii Pro Studio software (Tobii Pro Studio,

Danderyd, Sweden). The measure used was dwell time. Dwell time is the time (ms) spent continuously fixating towards an AOI over the course of a trial. Proportion of dwell time was then calculated, this was the proportion of time spent continuously fixating towards each AOI, relative to overall time. AOIs were separated into posters, alcohol and non-alcohol (see figure 3.1).

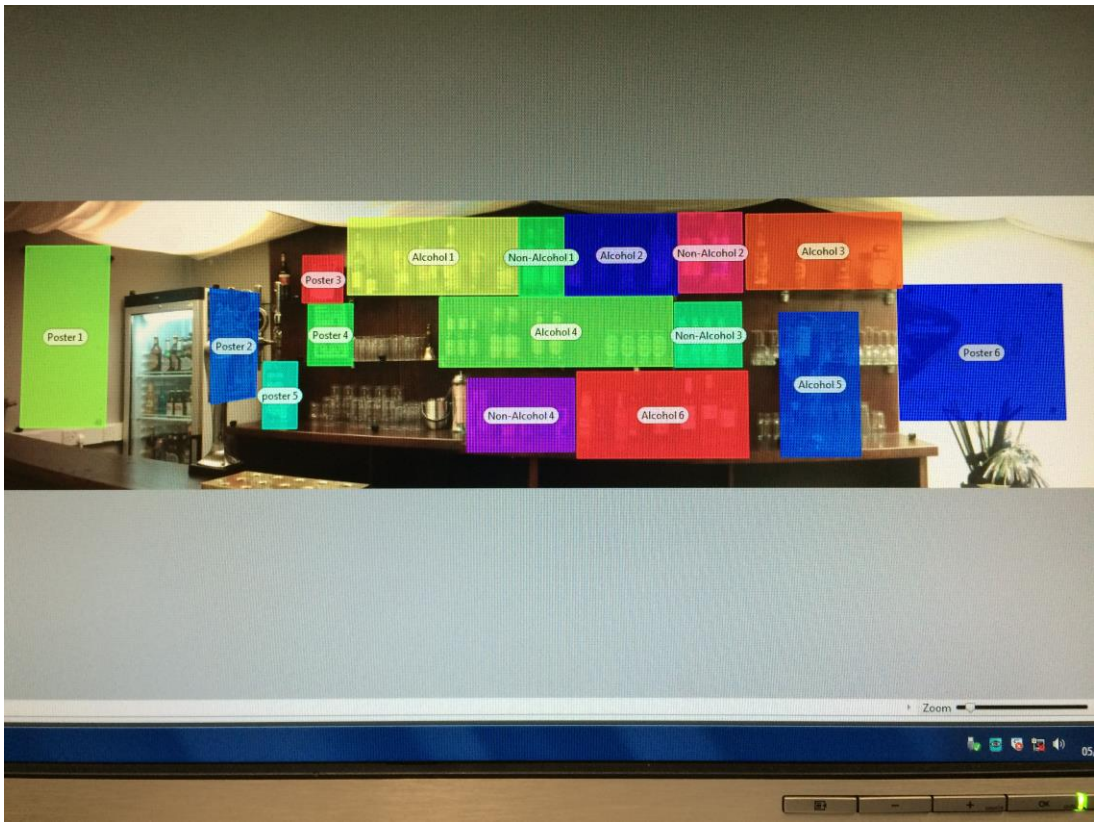



*Figure 3.1. AOI map*

*Posters (7 posters per condition) (see Appendix 8)*

*Anti-alcohol posters:* Seven posters with different anti-alcohol messages were used. Four were fear-based, containing emotive images (e.g. see figure 3.2). Three posters contained alcohol-related information to encourage responsible drinking (e.g. see figure 3.3).

*Pro-alcohol posters:* Seven posters with different alcohol advertisements were included (e.g. see figure 3.4). Four of these posters were advertisements for specific common drinks (Strongbow, Jack Daniels, Jägermeister and Guinness). Three of the

posters were general drinks deals, with offers on certain drinks, such as ‘cocktails £4.35’, ‘all day every day’ and ‘2-for-1 cocktails’.

*Neutral posters:* Seven music posters containing advertisements for bands and music events.

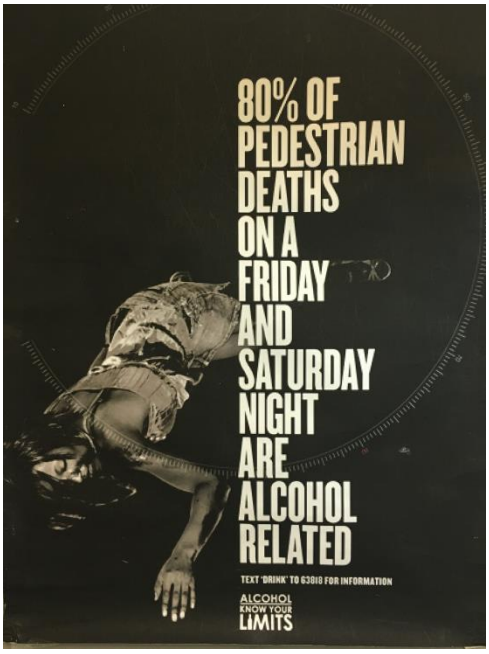



*Figure 3.2. Fear based anti-alcohol poster*


*Figure 3.3. Responsible drinking anti-alcohol poster*

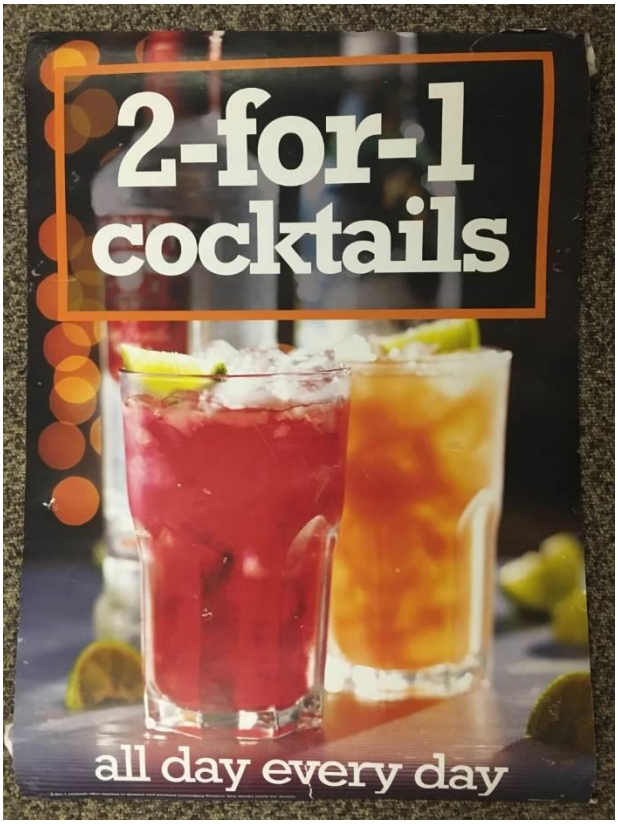



*Figure 3.4. Pro-alcohol poster*

Outcome Measures

*Alcohol Urge Questionnaire (AUQ, see Appendix 9)* (Bohn, Krahn & Staehler, 1995). This is an eight-item state measure that assesses the urge for an alcoholic drink at the time the questionnaire is completed, and is therefore a measure of acute craving. The eight items cover urges and desires, intent, anticipation of positive and relief of negative affect (Drummond & Phillips, 2002). Items are scored across a 7 point Likert Scale from 'strongly disagree' to strongly agree'. Studies indicate AUQ has a single structure factor (Bohn et al., 1995; Drummond & Philips, 2002). It has a high internal consistency ($\alpha = 0.91$) and good test-retest reliability (Bohn et al., 1995).

*Alcohol Purchase Task (APT, see Appendix 10)* (Murphy & MacKillop, 2006). The APT is a hypothetical purchase task that measures willingness to consume alcohol by assessing self-reported alcohol consumption and financial expenditure across a range of drink prices. Purchase tasks measure the relative reinforcing efficacy (RRE) of a drug within a behavioural economic framework. The first question assesses alcohol purchases at zero cost per drink, and subsequent questions gradually increase the price up to a level at which purchases and consumption are suppressed (Murphy, MacKillop, Skidmore & Pederson, 2009). The following APT indices were used in this study: $P_{max}$: the price at which alcohol consumption starts to be affected in direct proportion to the change in unit price, *intensity*: the amount of alcohol consumed when freely available, $O_{max}$: highest total amount willing to be spent on alcohol and *breakpoint*: price at which consumption falls to 0. Higher intensity, $P_{max}$, $O_{max}$ and breakpoint values provide evidence for a greater reinforcing efficacy of alcohol for an individual (Murphy & MacKillop, 2006). The APT has been shown to have good construct validity (Kiselica, Webber & Bornovalova, 2015), with responses on the APT conforming to models that describe drug reinforced responding and consumption in laboratory research (Murphy et al., 2009). It has been suggested that behavioural economic measures of the value of alcohol can complement craving measures to show fluctuations in drinking motivation following intoxication (Amlung, McCarty, Morris, Tsai, & McCarthy, 2015).

*Concurrent choice task* (developed from the training task in Hogarth & Chase, 2011; Hogarth, Field & Rose, 2013). In the concurrent choice task, participants make one

of two responses per trial to earn a distinct reward (alcoholic/non-alcoholic drink). On-screen instructions state: 'this is a game in which you can earn alcohol or soft drink points. In each trial, press the D or H key to try and win these rewards. You will only win on some trials. Press the space bar to begin. 'Each trial requires the participant to select one of two responses (D/H) on a keyboard to win points for alcohol or soft drinks.' One key is associated with alcohol drink points and the other is associated with soft drink points. One outcome is scheduled to be available in each trial (at random), therefore each key only has a 50% chance of producing its outcome. Participants receive feedback after each response, 'alcohol point' or 'soft drink point' for a correct response or 'nothing' for an incorrect response. This allows them to learn the response-outcome contingencies (which key is associated with alcohol/soft drink). The response outcome was counterbalanced across participants and the task comprised 60 trials in total. Percent choice of the alcohol drink over the soft drink choice was the main measure.

Both the APT and choice task were conducted by the researcher. That is, the researcher asked the participant how they would like to respond and the participants gave verbal responses (which the researcher then recorded). This method was used because, following drink consumption, participants were wearing Tobii eye tracking glasses so that attention to environmental cues could be recorded while participants performed these alcohol motivation tasks.

Alcohol Administration

Dose of alcohol was 0.0 g/kg for the placebo session and 0.6 g/kg for the alcohol session. Alcohol dose was a moderate dose based on previous priming research (Rose & Duka, 2006). Alcohol drinks were calculated on the basis of body weight and administered as pure alcohol mixed with lemonade, as a ratio of 1:3. The placebo dose was matched in volume to the alcohol dose for each participant. The placebo was lemonade sprayed with an alcohol mist (vodka) that resembled condensation and provided a strong alcohol scent as the beverage was consumed. The dose was separated into three glasses, and participants were required to consume all three in a 20 minute period (around 6.5 minutes per beverage). Participants were not given any specific information regarding the contents of the drink during a particular condition.

## Procedure

Testing took place between 12pm and 6pm on weekdays, therefore avoiding provision of alcohol in the morning and testing during times in which participants are more likely to drink in real world situations. Participants were asked to consume a high carbohydrate, low fat meal the night before and a light meal (e.g. a sandwich) an hour before the experimental session to standardise alcohol absorption and metabolism across participants. They were asked to avoid drinking alcohol before the experiment, and to avoid heavy drinking the night before. Participants attended the laboratory for two experimental sessions. In the first session, participants provided informed consent and were weighed. A breathalyser reading of 0.0 mg/l was required at the start of each session, before testing could begin.

In a neutral lab, participants completed a battery of questionnaire measures in session one only, including the STA, AUDIT, TLFB. In both sessions, baseline measures of motivation for alcohol were taken (AUQ, APT, concurrent choice task). Participants were then given a drink to consume: 0.0g/kg (placebo) or 0.6g/kg (alcohol). The order in which participants completed the alcohol and placebo conditions was counterbalanced. Sessions were separated by a minimum of one day and a maximum of one week

After the drinking period, participants were taken to a semi-naturalistic bar-laboratory and immediately fitted with the Tobii eye-tracking glasses. They were then required to sit at the bar for a rest period of ten minutes, in which they could freely look around the bar. At the end of the rest period the APT and concurrent choice task were delivered to the participant for a second time by the researcher. Tobii glasses were then removed and participants completed a second AUQ. Participants were then breathalysed, before being debriefed and compensated for their time. If participants' breath alcohol concentration scores were over 0.17mg/l (half the U.K. legal driving limit), they were advised to stay in the laboratory or signed a waiver to confirm they were aware of their level of intoxication.

### 3.4 Results

Participant Characteristics

Descriptive statistics are presented in table 3.1. MANOVA indicated groups did not statistically differ on any of these factors (ps > 0.30). The sample was made up of 90% risky drinkers, identified by an AUDIT score of 8 or above (Babor et al., 2001).

Of the participants, 3 guessed the aim of the study. When conducting the analysis with and without these participants, findings did not differ, so they were included in the final sample.

**Table 3.1. Means (±SD) for participant characteristics by poster condition**

| | *Mean scores(±SD)* | | | | *Statistics (MANOVA)* | |
|---|---|---|---|---|---|---|
| Variable | *Pro-alcohol posters (20) Female (10) Male (10)* | *Anti-alcohol posters (20) Female (11) Male (9)* | *Neutral posters (20) Female (7) Male (13)* | *Overall (60) Female (28) Male (32)* | *F* | *p* |
| Age (y) | 23.56 (4.17) | 25.51 (6.82) | 24.78 (5.8) | 24.51 (5.65) | 0.45 | 0.64 |
| STA (5-30) | 14.85 (4.21) | 14.60 (4.49) | 16.30 (2.99) | 15.25 (3.96) | 1.10 | 0.35 |
| AUDIT (0-40) | 13.85 (6.07) | 12.05 (4.86) | 11.60 (4.56) | 12.50 (4.86) | 1.21 | 0.31 |
| Weekly consumption (TLFB) (units) | 18.88 (10.65) | 18.71 (8.91) | 18.25 (9.06) | 18.61 (9.41) | 0.02 | 0.98 |
| Weekly binge (units) | 1.28 (1.09) | 1.50 (1.04) | 1.20 (0.98) | 1.33 (1.03) | 0.45 | 0.64 |

STA = Susceptibility to Alcohol; TLFB = Time Line Follow Back; AUDIT = Alcohol Use Disorders Identification Test; Weekly binge = number of binge drinking episodes per week

Susceptibility to Advertising (STA)

Participants scored 15.25 (±3.96) on the susceptibility to alcohol advertising (STA) questionnaire, the mean score on each question was 2.54 (out of 5), which indicates the majority of participants scored midway between ‘agree’ and ‘disagree’ on susceptibility to advertising.

Breath Alcohol Concentration (BrAC)

Average BrAC reading at the end of the alcohol session was 0.32 (±0.09) mg/l, and 0.00 (±0.00) mg/l at the end of the placebo session. Readings did not differ between poster conditions, [F (2, 57) = 0.57, p = 0.57].

Alcohol Urge (see Figure 3.5)

Scores on the AUQ were log transformed before analysis to correct skewness. A 2 (drink: alcohol/placebo) x 2 (time: baseline/post-drink) x 3 (poster: pro-alcohol/anti-alcohol/neutral) mixed-design ANOVA was used to investigate change in urge across conditions. There was a significant main effect of time, [F (1, 57) = 37.35, $p < 0.001$, $\eta p^2 = 0.4$]: urge increased post bar-lab. The main effect of drink, [F (1, 57) = 3.69, p = 0.06, $\eta p^2 = 0.06$] and the drink x time interaction, [F (2, 57) = 3.81, p = 0.06, $p^2 = 0.06$] were approaching significance.

Post-hoc paired samples t-tests indicated that the increase in urge, from baseline to post-drink, was significant after both the alcohol, [t (1, 59) = -4.84, $p < 0.001$] and the placebo drink, [t (1, 59) = -4.68, $p <0.001$].

Due to the marginally significant interaction an urge change score was calculated (post-drink urge – baseline urge). A paired samples t-test indicated that the difference in increase in urge after alcohol (M = 6.58, ±10.4) compared to placebo (M = 3.5, ±6.02) were non-significant, [t (1, 59) = -0.52, p =0.6].

There was no significant main effect of poster condition (F = 0.28, p = 0.76). The drink x poster condition (F = 0.5, p = 0.61), time x poster condition (F = 1.89, p = 0.16) and the drink x time x poster condition (F = 0.87, p = 0.43) interactions were all non-significant.

Therefore, alcohol urge increased significantly after both alcohol and placebo drinks, once participants were in the bar-lab.

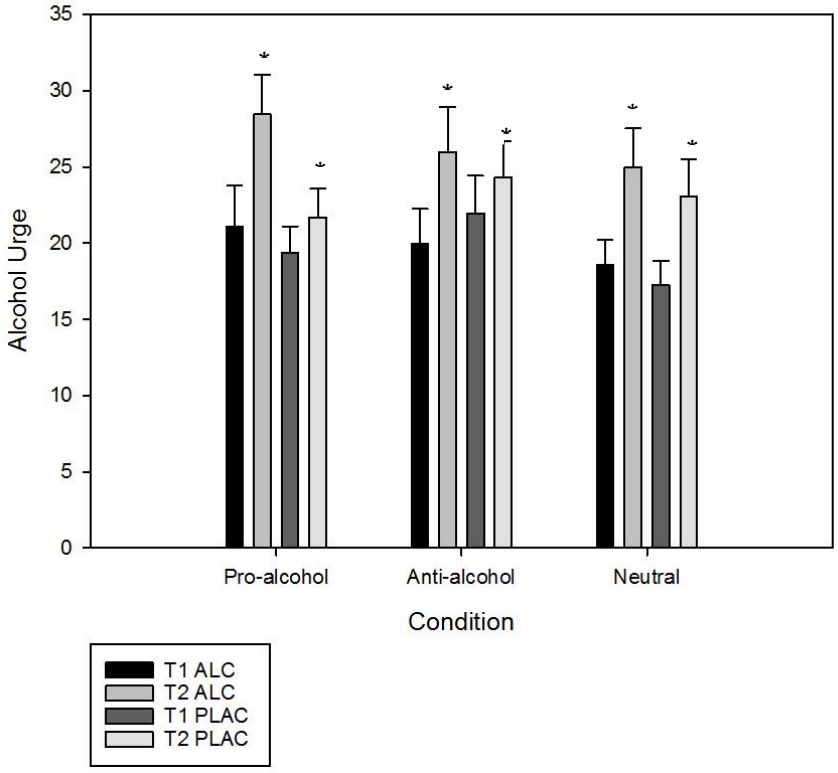



*Figure 3.5. Alcohol urge, by poster condition. Error bars represent SE of the mean. *Significant difference from T1 to T2, p<0.05.*

Choice task (see Figure 3.6)

Scores on the choice task were log transformed before analysis to correct skewness. A 2 (drink: alcohol/placebo) x 2 (time: baseline/post-drink) x 3 (poster: pro-alcohol/anti-alcohol/neutral) mixed-design ANOVA was used to investigate proportion of alcohol choices on the choice task. There was a significant main effect of time [F (1, 57) = 6.31, p = 0.02, $\eta p^2 = 0.1$]; proportion of alcohol choices increased post bar-lab. In addition, there was a main effect of drink, [F (1, 57) = 4.74, p = 0.03, $\eta p^2 = 0.08$]; proportion of alcohol choices were higher after alcohol than placebo. The time x poster interaction approached significance [F (1, 57) = 2.76, p = 0.07, $\eta p^2 = 0.04$]. Post-hoc paired sample t-tests indicated that there was a significant increase in proportion of alcohol choice in the pro-alcohol poster condition [t (1, 19) = -2.77, p = 0.01] but not in the anti-alcohol or neutral condition (ps >0.25).

There were no other significant main effects of poster condition (F = 0.34, p = 0.71). The drink x poster condition (F = 1.06, p = 0.35), drink x time (F = 0.01, p = 0.91) and the drink x time x poster condition (F = 0.89, p = 0.42) interactions were all non-significant.

Therefore, alcohol choice increased in the pro-alcohol poster condition.

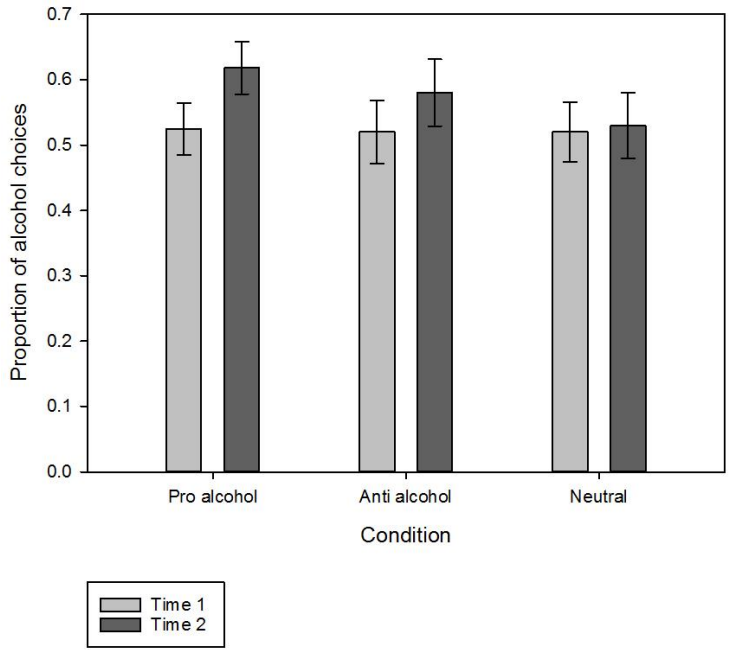



*Figure 3.6. Proportion of alcohol choice, by poster condition. Error bars represent SE of the mean. *Significant difference from T1 to T2, p <0.05.*

Alcohol Purchase Task (see table 3.2)

All scores on the APT were log transformed before analysis to correct skewness. A 2 (drink: alcohol/placebo) x 2 (time: baseline/post-drink) x 3 (poster: pro-alcohol/anti-alcohol/neutral) mixed-design ANOVA was used to investigate each measure on the Alcohol Purchase Task.

$O_{max}$: There was a significant main effect of time [F (1, 57) = 66.96, p < 0.001, $\eta p^2$ = 0.54] and there was a significant main effect of drink [F (1, 57) = 10.48, p = 0.002, $\eta p^2$ = 0.16], this was subsumed by the time x drink interaction [F (2, 57) = 57.18, p < 0.001, $\eta p^2$ = 0.5].

Post-hoc paired sample t-tests indicated that the significant increase in $O_{max}$ was observed after both alcohol [t (1, 59) = -8.23, p < 0.001] and placebo [t (1, 59) = -2.25, p = 0.03].

To investigate the interaction an $O_{max}$ change score was calculated (post drink – baseline). A paired samples t-test indicated that $O_{max}$ increased to a greater extent after alcohol (M = 3.71, ±8.47) compared to placebo (M = 0.79, ±2.64), [t (1, 59) = 2.67, p = 0.01].

$P_{max}$: There was a significant main effect of time [F (1, 57) = 4.31, p = 0.04, $\eta p^2$ = 0.07] and a significant main effect of drink [F (1, 57) = 37.15, p < 0.001, $\eta p^2$ = 0.4]. Indicating that $P_{max}$ increased post bar-lab and was higher after alcohol than placebo.

*Intensity***:** There was a significant main effect of time [F (1, 57) = 3.92, p = 0.05, $\eta p^2$ = 0.06], indicating that intensity increased post bar-lab.

*Breakpoint*: The main effect of time [F (1, 57) = 3.18, p = 0.08, $\eta p^2$ = 0.05] and main effect of drink [F (1, 57) = 0.3, p = 0.09, $\eta p^2$ = 0.05] were approaching significance, indicating an increase post bar-lab, and a higher breakpoint after alcohol than placebo.

There were no other significant main effects (Fs< 3.18, ps > 0.76) or interactions (Fs < 2.15, ps > 0.15) for the APT measures.

These findings demonstrate that all APT measures increased post drink (i.e. when in the bar-lab), with $O_{max}$ and $P_{max}$ significantly higher after alcohol compared with placebo.

**Table 3.2. Means (±SD) for APT indices, by poster condition (N=60)**

| | Mean scores (±SD) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pro-alcohol posters | | | | Anti-alcohol posters | | | | Neutral posters | | | |
| | Alcohol | | Placebo | | Alcohol | | Placebo | | Alcohol | | Placebo | |
| | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| $O_{max}$ (£) | 7.73 (8.43) | 14.00 (18.76) | 8.05 (6.90) | 9.13 (8.30) | 7.25 (9.13) | 8.16 (8.78) | 6.40 (7.17) | 6.90 (7.93) | 5.77 (4.23) | 9.73 (8.43) | 6.73 (6.14) | 7.51 (6.93) |
| $P_{max}$ (£) | 3.00 (1.74) | 3.53 (1.31) | 2.78 (1.11) | 3.15 (1.48) | 2.68 (1.71) | 2.99 (2.48) | 2.63 (2.04) | 3.20 (2.46) | 2.79 (1.70) | 3.35 (2.08) | 2.73 (1.91) | 2.99 (1.80) |
| Break(£) | 5.30 (3.35) | 6.28 (2.89) | 5.25 (3.08) | 5.60 (3.02) | 4.99 (3.43) | 4.96 (3.69) | 4.53 (2.90) | 4.73 (2.99) | 4.76 (2.45) | 6.13 (4.27) | 4.59 (2.51) | 4.51 (3.36) |
| Intensity (£) | 6.40 (10.58) | 7.95 (14.78) | 5.55 (6.15) | 5.20 (4.09) | 4.32 (3.76) | 4.57 (4.18) | 4.50 (4.10) | 4.90 (4.12) | 3.45 (2.37) | 3.85 (2.85) | 3.75 (2.57) | 3.70 (2.72) |

Dwell time

Scores were square rooted before analysis to correct skewness. Dwell time (proportion of sum fixation, of total time period) was measured to areas of interest (AOIs): 1) posters (these differed across poster condition) 2) alcohol (e.g. beer pump) 3) non-alcohol AOIs (e.g. soft drinks). See figure 3.1 for AOI map.

Dwell time (See Figure 3.7): A 2 (drink: alcohol/placebo) x 3 (AOI: posters/non-alcohol/alcohol) x 3 (poster: pro-alcohol/anti-alcohol/neutral) mixed-design ANOVA with Greenhouse Geisser correction was conducted. There was a significant main effect of AOI type [$F(1.33, 80.79) = 309.7$, $p < 0.001$, $\eta p^2 = 0.85$]. Attention to general alcohol AOIs was higher than attention to both non-alcohol and poster AOIs.

There were no significant main effects of poster condition ($F = 0.56$, $p = 0.58$). The drink x poster condition ($F = 0.3$, $p = 0.75$), AOI x poster condition ($F = 0.26$, $p = 0.84$), drink x AOI ($F = 39$, $p = 0.62$) and the drink x AOI x poster condition ($F = 0.3$, $p = 0.83$) interactions were all non-significant.

Therefore, there was increased attention to alcohol AOIs across all conditions, and no effect of poster condition or drink on dwell time.

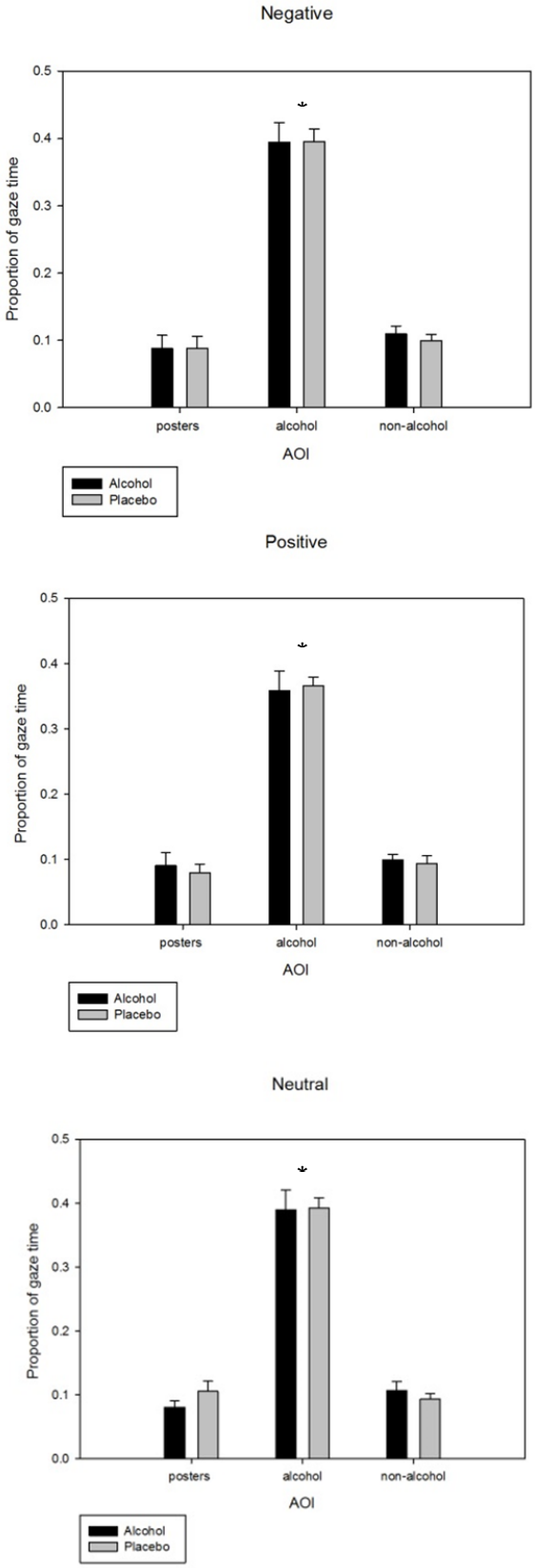



*Figure 3.7. Proportion of dwell time to AOI type, by poster condition. Error bars represent SE of the mean. *Significant difference between conditions, $p<0.05$.*

### 3.5 Discussion

This study investigated the effect of anti- and pro- alcohol posters on motivation to drink in a semi-naturalistic bar-laboratory, after an alcohol (0.6g/kg) or placebo drink of alcohol. It was hypothesised that anti-alcohol posters would lead to decreased motivation for alcohol and pro-alcohol posters would lead to increased motivation for alcohol, compared to a control condition, and that the decreased motivation would be weaker following alcohol consumption due to priming effects. These hypotheses were partially supported, as an increase in choice of alcohol was found in the pro-alcohol poster condition, but not in the anti-alcohol poster condition. The study did not find any other significant effects of poster content on other motivation measures (urge and APT task indices). It was also hypothesised that there would be increased attention to pro-alcohol posters and decreased attention to anti-alcohol posters after alcohol consumption and that these would be associated with changes in motivation to drink. These hypotheses were not supported as there were no differences in dwell time between the three poster conditions (anti, pro, neutral poster).

Results did indicate that the combination of the bar-laboratory context and the administration of alcohol and placebo can affect measures of motivation to drink. Urge and APT indices increased post bar-lab after both alcohol and placebo administration, with $O_{max}$ (maximum amount participants were willing to spend on alcohol) showing more pronounced increases after alcohol irrespective of poster condition. Proportion of choice increased post bar-lab after a placebo drink in the neutral poster condition and after both drinks types in the pro-alcohol poster condition.

It was hypothesised that the anti-alcohol posters would lead to a reduced motivation to drink compared to pro-alcohol and neutral posters. One finding partially supported this hypothesis. There was a significant increase in alcohol choice in the pro-alcohol poster condition after both drink types, but not in the anti-alcohol poster condition or control group. This finding must be interpreted with caution as the interaction was only marginally significant, however it suggests that alcohol advertisements may increase choice for alcohol when displayed in a bar environment, supporting findings that marketing methods can increase drinking behaviour (Anderson et al., 2009a).

Choice for alcohol did not decrease as hypothesised, but it did not increase as it did in the pro-alcohol condition, this shows that drinking campaign posters may have some benefit when presented in a bar environment. This provides tentative support for studies which show these campaigns may have some benefits (e.g. York et al., 2012). Perhaps such campaigns may attenuate the general motivating effects of being in an alcohol-related environment, However, there were no other significant findings on any other motivation measure.

Overall, the ineffectiveness of the anti-alcohol posters in decreasing motivation to drink supports previous research showing media campaigns have little impact on behaviour (Anderson et al., 2009a). More concerning are findings from Moss and colleagues (2015); in a series of bar-lab studies the presence of responsible drinking messages increased subsequent consumption. Therefore, results suggest that health campaigns may not just be ineffective, but could potentially be counterproductive. Reasons for the lack of support for the use of anti-alcohol health campaigns in this study and previous studies can be explained by the reflective-impulsive model, which posits that two separate systems interact to guide our drinking behaviour (Strack & Deutsch, 2004). The reflective system uses a decision making process to guide behaviour whereas if a behaviour is activated by the impulsive system, it is carried out automatically, without any intentions or goals. Health campaigns aim to engage our reflective system, by providing information to alter beliefs and attitudes and help individuals develop self-monitoring skills (Quigley, 2013). On the other hand, the impulsive system can be automatically and implicitly activated by environmental cues, which can override the reflective system. The strength of the impulsive system should be greater when drinking occurs in an environment that the individual associates with alcohol and contains alcohol cues (e.g. a pub) (Hofmann et al., 2008). This is supported in the current study by the increase in choice for alcohol in the pro-alcohol condition and the finding that participants paid more attention to general alcohol cues than any other cue in all conditions, and although this may have been due to there being more of these cues, there was still very limited attention toward the posters. It is possible, therefore, that interventions implemented in drinking environments need to target the impulsive system, rather than providing information-based interventions which require the reflective system (Liu et al., 2014).

This may be particularly relevant given that the participant population consists mainly of young students. It has been suggested that, especially in this population, fear appeals may lead to a feeling of irrelevance (Hastings, Stead & Webb, 2004) due to a limited sense of personal mortality (Szmigin, Bengry-Howell, Griffin, Hackley & Mistral, 2011). Campaigns focussed on individual responsibility are unlikely to be engaged with (Szmigin et al., 2011), supported by limited attention to the posters. Therefore, methods which do not require conscious attention may be particularly beneficial for younger drinkers.

Urge (which measures acute craving for alcohol) increased significantly after consumption of both the alcohol and placebo drinks. The increases in both drink conditions supports previous work showing alcohol and placebo drinks increase urge (Rose & Duka, 2006; Rose & Grunsell, 2008). However, most studies show a greater increase after an alcohol dose (Rose & Duka, 2006; Rose, Jones, Christiansen & Clarke, 2013). The reason for similar increases may be due to general effects of the bar-laboratory context on urge, as the majority of previous research is carried out in less naturalistic laboratory environments (e.g. Rose & Duka, 2006; Rose et al., 2013). However, recent research carried out in a bar-lab found that placebo increased craving compared to a control, but that environmental context did not have an additive effect on these increases (Christiansen, Townsend, Knibb & Field, 2017). Therefore, an alternative explanation is that increases in the placebo condition are due to the expectation of intoxication effects. Activation of alcohol expectancies have been shown to have a significant influence on drinking behaviour (Wardell & Read, 2014). If participants in the current study expected alcohol, their urge for alcohol may have increased due to a placebo effect (e.g. they felt intoxicated) or a frustration effect (e.g. they wanted to drink more to achieve the expected effects).

In the neutral poster condition, proportion of alcohol choices increased in the bar-lab following placebo, but not alcohol, consumption. This does not support research which shows that an alcohol dose increases choice of alcoholic drinks (Rose & Duka, 2006). However, there have been mixed findings with priming and choice tasks (Rose & Grunsell, 2008; Kirk & De Wit, 2000). This could be due to the task itself; e.g. hypothetical choice measures may differ from real behavioural responses to priming. It may be easier to restrain consumption with a hypothetical scenario than if participants were given the opportunity to consume a real drink (Duka, Tasker &

Stephens, 1998b). Alternatively, perhaps the lack of an urge effect following alcohol consumption illustrates a satiation effect, so that participants felt no need to consume more. The reason for the differing findings with choice and urge may suggest that these measures assess different processes; urge measures acute craving for alcohol, but craving a drink does not necessarily mean an individual will choose to continue drinking.

In terms of alcohol demand, the maximum amount participants were willing to spend on alcohol ($O_{max}$), the price at which expenditure is maximised ($P_{max}$), the amount of alcohol consumed when freely available (intensity) and the price at which consumption falls to 0 (breakpoint) all increased following an alcohol and placebo drink. This shows that in the bar-lab participants ordered a larger quantity of drinks at a higher price and were willing to spend more on a single drink. Furthermore, $O_{max}$, $P_{max}$ and breakpoint were higher after an alcohol drink, compared to placebo. This indicates that intoxication and the environmental effects of the bar-lab led to an increase in hypothetical spending and drinking behaviour. However, the increase in breakpoint must be interpreted with caution as p-values are only marginally significant. These findings support previous research showing that alcohol demand indices increase following exposure to alcohol-related cues (MacKillop et al., 2010, Amlung et al., 2015). It is worth noting that some APT indices ($O_{max}$, $P_{max}$ ) increased to a greater extent than others (break, intensity) following intoxication and exposure to the bar-lab. There has been inconsistency in APT literature; some have found that alcohol exposure only increases breakpoint and $P_{max}$ (Burjarski, MacKillop & Ray, 2012) while others have found that alcohol only increases breakpoint and intensity (Amlung et al., 2015). These discrepancies may be due to differences in the populations being investigated; e.g. Burarski et al (2012) used an Asian American sample and Amlung et al. (2015) had a more moderate drinking sample than the current study. It could also be due to differences in the testing contexts; the current study was carried out in a bar-lab whereas the aforementioned studies were carried out in standard laboratories.

This study had several limitations. Firstly, the study has limited power due to a relatively small sample size. Previous research into fear campaigns have found small to medium effects (Peters et al., 2013), therefore a larger sample size may have

detected these effects. This is supported by p-values that are approaching significance.

The study used self-report measures and hypothetical tasks to measure motivation to drink. It could be argued that measures of motivation may not relate to actual alcohol consumption. For example, alcohol administration can increase ad libitum alcohol consumption but may not effect behavioural responses on tasks (Christiansen et al., 2012). Often, how much individuals say they want to drink and how much they do drink do not relate (Roberts & Fillmore, 2015). Therefore if actual consumption was used as an outcome measure the results may have differed. However, research does indicate that intentions are good predictors of behaviour (Cooke, Dahdah, Norman & French, 2016) and we did not want to offer participants more alcohol after a moderate priming dose. Future research should assess the effect of anti- and pro-alcohol messages on actual consumption measures before drawing firm conclusions.

Absence of differences in attention to the posters between doses may have been due to too short a rest period following drink administration. For example the priming effect has been shown to peak 30 minutes following the drink, when blood alcohol level (BAL) is at its highest (Rose & Duka, 2006). For practical reasons the measures were taken after a shorter period of time, but there may have been significant differences between drinks if measures had been taken after a longer rest period.

Another limitation of this study is the lack of soft drink control. Placebo drinks can produce significant impairments in inhibitory control in comparison with a control group (Christiansen, Jennings & Rose, 2016b). Therefore, to separate the anticipatory effects of the placebo drink from the effects of the environment a control group (e.g. soft drink condition) is needed. For example, a recent study highlights the effects of a placebo dose on craving, subjective intoxication and beer consumption compared to a control (Christiansen et al., 2017). Future research should incorporate this paradigm to establish whether increases in motivation are due to a placebo effect or context effect.

In summary, we demonstrated that anti- alcohol posters do not effect motivation to drink alcohol compared to a control condition, and this may be because they are not attended to. Alcohol choice increased in the presence of pro-alcohol posters and there was no effect of pro-alcohol posters on any other alcohol motivation measures.

Attention to the posters across all conditions did not differ, and participants showed a bias towards general alcohol-related cues. The increase in motivation for alcohol in the bar-lab after both alcohol and placebo consumption suggests several possibilities, including the importance of environmental factors as well as alcohol expectancy and pharmacological effects. Reasons for the ineffectiveness of anti-alcohol campaigns in this environment and population are explained from a reflective-impulsive perspective. Specifically, the impulsive system and consequently choice for alcohol is triggered by alcohol cues and the anti-alcohol posters are ineffective in engaging the reflective system in this environment. It is suggested that changes to the drinking environment that impact the automatic nature of drinking may be more likely to have an impact on behaviour.

# Chapter Four (Study Three)

## The effect of glass labels on alcohol consumption

## 4.1 Abstract

Heavy alcohol consumption is common in the UK, particularly in young adult populations, where there are high levels of alcohol-related risk and harm. This could be due, in part, to poor knowledge of units, correct guidelines and health consequences of excessive drinking. To help rectify this, health warning labels are mandatory on alcohol products in the UK, yet a substantial amount of drinking activity does not involve the consumer seeing the package. The current study investigated the effect of a labelled Drink Wise glass, compared to a plain glass, on alcohol consumption. It was hypothesised that the labelled glass would reduce consumption of alcohol during a twenty minute ad libitum drink period. Eighty-one pairs of social drinkers aged between 18 and 30 years old attended a single experimental session in a semi-naturalistic bar-laboratory setting. A battery of questionnaires measured drinking habits, alcohol-related problems, readiness to change (RTC), and alcohol urge. Pairs consumed preferred beer or wine and were randomised to pour into and drink from either a labelled 340ml Drink Wise glass displaying warnings and information on units, or a plain glass of the same size. The total amount of alcohol consumed in a twenty minute ad libitum drinking period was measured. Due to drinking imitation within pairs the population was clustered, therefore a multilevel modelling approach was used for analysis. Findings showed there were no significant effects of the Drink Wise glasses on alcohol consumption despite the majority of participants (85%) noticing the labels. There were no interactions between consumption and participant characteristics. Warning and unit labels on glasses do not appear to influence alcohol consumption in the current population, in a naturalistic drinking environment. This may be due to information content and characteristics of the glass. Alcohol harm-reduction strategies aimed at young adult drinkers need to use alternative strategies, especially in naturalistic drinking environments, to achieve behaviour change.

## 4.2 Introduction

The majority of those who drink more than the recommended government guidelines do not believe their drinking is putting their long-term health at risk, and only 18% of those who drink excessively want to change their behaviour (HM Government, 2012). In some individuals, this could be related to poor knowledge of safe guidelines. With alcohol's harms and addictive effects directly related to the amount of alcohol that is consumed (Das et al., 2014), it is vital that individuals possess accurate knowledge regarding alcohol content to be able to monitor and reduce their intake (Kerr & Stockwell, 2012).

The concept of counting alcohol units was first introduced in the UK in 1987, and is used widely as a method to monitor alcohol consumption (Stockwell & Stirling, 1989). Alcohol is measured in units due to variation in the strength of alcohol and size of measures. In the UK one unit is 8g of pure alcohol, which is roughly the amount of alcohol the average adult can process in an hour (NHS, 2013). The public need to understand units to be able to monitor drinking, however, the unit system can be confusing. Variability of percent alcohol by volume (%ABV) within beverage type makes it difficult to provide a standard pour size, even for a specific type of drink (Kerr & Stockwell, 2012). Another difficulty is that official definitions vary across countries; with the US's unit nearly double the size of the UK's unit (Grant, 1998). Often it is assumed that one unit is one 'normal' drink, however this is not the case, for example a pint of 4%ABV beer and a 175ml glass of 11%ABV strength wine are both over 2 units (Seabrook, 2007).

The first study investigating the unit system was published almost 30 years ago, and found that serious inaccuracies result when using the system for drinks with high or low strength alcohol content (Stockwell & Stirling, 1989). Findings do not show increased promise in recent years. In 2009, 90% of respondents had heard of calculating consumption in units, up 11% from 1997. This indicates awareness of the unit concept has increased in recent years. However, only 13% kept a check on number of units they drank (Lader & Steel, 2010). In a survey of 297 respondents it was found that only 20% employ safe guidelines to guide their drinking (Gill & O'May, 2007b) and in a smaller sample of female students just over half could quote

their favourite drink's unit content but only 14% used the unit system to guide drinking (Gill & O'May, 2007a). Another study found that only 13% of undergraduates defined binge drinking in terms of units and they overestimated how many units constitute sensible drinking. Official definitions for UK bingeing are ≥8 units for men and ≥6 units for women (NICE, 2010). However, 75% of participants believe that a binge was greater than this, with an overestimation of nearly 5 units for the binge threshold for men, and over 3 units for women (Cooke, French & Sniehotta, 2010). Knowledge is even lacking in populations who are expected to have good understanding; when medical trainees have previously learned about screening for 'at risk alcohol use' in medical school, most still do not know basic facts about standard drink equivalents (Welsh et al., 2013) and 18% of junior doctors in one study had no knowledge of alcohol units (Das et al., 2014). Drinkers are also less likely to know the recommendations (correct guidelines and health risks) than non-drinkers, with those drinking above the guidelines even less so (Cotter, Perez, Dunlop, Kite & Gaskin, 2013). This indicates knowledge of units is generally poor, especially in heavier drinkers, and an awareness of the concept of units does not necessarily mean an individual is well informed on safe guidelines or uses units to guide drinking behaviour.

The result of this lack of knowledge is an accidental over-pouring effect, with individuals believing they are pouring and drinking fewer units than they actually are. In a recent review it was concluded that drinkers have extreme difficulty defining a standard drink and over-pouring is the norm (Kerr & Stockwell, 2012). A subsequent systematic review on pouring studies found that participants often pour more than one standard drink or unit as their self-defined usual glass (Boniface, Kneale & Shelton, 2013). A study in US students found that free-pours were larger than standard drinks, as were self-definitions of a standard drink (White et al., 2005). This effect has been found with both college students and professional bar tenders, both showing an over-pouring effect with spirits into empty glasses (Wansink & van Ittersum, 2005). In a UK study participants poured 1.92 units of wine and 2.3 of spirits when asked to pour a standard drink (Gill & Donaghy, 2004) and in a separate study 2 units were poured for both wine and spirits (Gill & O'May, 2007b). This effect has been attributed to an underestimation of beverage volumes or strengths and is most pronounced with consumption away from licensed premises (Boniface et al.,

2013); with 2/3 of UK alcohol sales in 2010 off-trade (British Beer and Pub Association, 2010), it is vital that an attempt is made to improve knowledge and accuracy.

It has been found that UK studies have the greatest discrepancy between self-defined sizes and standard drinks, and also the smallest standard drink sizes (Devos-Comby & Lange, 2008), reflecting a lack of knowledge and overestimation of standard drinks. This suggests that harm-reduction methods should focus on educating the public on standard drink sizes and improving accuracy with pouring, as it has been shown that both knowledge and experience can affect volume poured (Devos-Comby & Lange, 2008).

Having the correct knowledge does not necessarily lead to a change in behaviour, even with the intention to. In the reflective-impulsive model of behaviour change drinking is framed in terms of a conflict between the impulsive and reflective system. The reflective system will attempt to make a decision based on expectancies and values of a health threat. Expectancies are defined as the beliefs regarding the cognitive, affective and behavioural consequences of drinking (Abrams & Niaura, 1987). The impulsive system often overrides the reflective system, and this is more likely in an environment with pro-drinking stimuli (Hofman, Friese & Wiers, 2008). Choice architecture (or nudging) purposefully shapes the immediate environment to target the impulsive system and produce behaviour change (Thaler & Sunstein, 2008). It is theorised that targeting this automatic impulsive system with interventions that involve an alteration in the immediate environment it may increase the likelihood that decisions will be affected. Labelling has been described as one such intervention, as it alters the properties of an object in an environment (Hollands et al., 2013).

Over 20 countries adopt mandatory alcohol warning labels on alcohol products and in the UK, government health warning labels giving details of alcohol unit content and safe daily guidelines for men and women are given on packaging (Wilkinson & Room, 2009). However, there is little research to support the effectiveness of this approach. A recent review of labelling concluded that information on unit content, guidelines and warning labels can provide information and educate but there is

limited impact on drinking behaviour (Knai et al., 2015). Another review of the international research literature on packaged alcohol labels concluded that although they can impact on message recognition, increase awareness and encourage discussion there is little evidence showing behaviour change (Wilkinson et al., 2009, Scholes-Balog, Heerde & Hemphill, 2012). Some have suggested that this could be due to the nature, location and style of the labels (Wilkinson et al., 2009), and that they need to be more noticeable, impactful and varied (Stockwell, 2006). The majority of reviews and primary studies into labelling are from the U.S. and many do not include adequate control conditions (Wilkinson et al., 2009). Furthermore, a substantial amount of alcohol consumption does not involve the consumer seeing the package (for example with drinkers who consume alcohol in restaurants and bars), therefore alcohol warnings and unit content should be available beyond the original packaging (Wilkinson et al., 2009).

A central aspect of pouring and consumption is the glass we pour into. In terms of marketing it has been proposed that the glass is of equal importance to advertising, sponsorship, packaging and product design and thus should be subject to the same control (Stead, Angus, Macdonald & Bauld, 2014). For example, branded glasses have been suggested to drive up sales (McFarland, 2002). The glass can also be another factor that can contribute to inaccuracy of pours, due to difficulties in estimating the volume of a glass. Consequently even knowing the %ABV of a beverage may not ensure an accurate standard drink is poured (Attwood et al., 2012). This could especially be true for alcohol with high %ABV (such as spirits), as small differences in volume can have a large impact on units consumed (Kerr & Stockwell, 2012).

This suggests that including labels and warnings on the side of the glass may be another avenue for potential harm-reduction. The information is immediately available at the moment of consumption, therefore it may be more likely to have an impact on behaviour compared to the provision of the same information outside of the drinking environment. In terms of the potential for widespread implementation it has been suggested that if alcohol is to follow in the footsteps of cigarette packaging then the time may have come for standardised, non-branded, measure-marked glassware with large harm-reduction messages (Stead et al., 2014).

A tool introduced for the public to monitor unit intake is the Drink Wise unit measure glass. Drink Wise was formed to help minimise the harm caused by alcohol and works for the National Health Service (NHS) and Local Authorities to raise awareness of alcohol harm and reduce the negative impact of alcohol. The unit measure glass was introduced by Drink Wise as a tool to calculate how many units are in a variety of drinks so that people can easily control their drinking. The glasses' potential as an effective harm-reduction method in terms of behaviour change and awareness is yet to be assessed.

In an experimental environment, drinking with others and a bar-laboratory context have both been shown to influence drinking behaviour (Quigley & Collins, 1999; Monk & Heim, 2013b). Research using a confederate paradigm shows that the observation of other people's drinking behaviour is one of the most important social determinants of an individual's drinking level (Larsen et al., 2010). With pairs of 'real' social acquaintances there is a large effect of social influence, which participants are unaware of (Dallas et al., 2014). Bar-laboratories can make the ability to refuse alcohol more difficult (Monk & Heim, 2013b) and increase consumption compared to a laboratory (Moss et al., 2015). In order to maximise the applicability and validity of results, research on alcohol interventions need to be conducted in more realistic settings. The study was conducted in a semi-naturalistic bar-laboratory and participants were tested in friend pairs to best mimic the situation in which similar 'warning-information' glasses could be used as part of an alcohol harm-reduction strategy.

The aim of the current experiment was to investigate the effectiveness of the Drink Wise glass, compared to a non-labelled, plain glass, in reducing alcohol consumption in a group of UK social drinkers. It was hypothesised that, compared to the non-labelled glass, the Drink Wise glass would result in reduced ad libitum alcohol consumption.

## 4.3 Method

Participants

One-hundred and seventy-eight participants (84 female; mean age 22.21 [SD ±3.63]) were recruited in pairs (with an equal mix of male, female and mixed pairs) from the University of Liverpool via advertisements, word of mouth and using the university's online EPR system. Participants were required to bring a friend who also fit the inclusion criteria. Inclusion criteria were fluency in English and weekly consumption of alcohol (mean weekly unit consumption: 26.42 [SD ±16.19], UK alcohol unit = 25ml of a standard spirit = 8 grams of pure alcohol). All participants provided informed consent before taking part in the study and received £5 reimbursement as compensation for their time. The study was approved by the University of Liverpool Research Ethics Committee.

Power calculation

As the sample was recruited in pairs (therefore individuals drinking behaviour is likely to be nested in the pairs) and previous research shows pairs imitate drinking (Larsen et al., 2010; Larsen, Overbeek, Granic, & Engels, 2012b), the data is clustered. Therefore the design effect formula was used to calculate sample size (Ukoumunne, Gulliford, Chinn, Sterne, & Burney, 1999). An intra-class correlation of 0.6 was chosen, based on previous pair drinking studies (Koordeman, Anschutz, van Baaren & Engels, 2011; Koordeman, Anschutz & Engels, 2012) and the following formula was used:

$$DE \text{ (Design Effect)} = 1+(n-1)p$$

*p=intra-class correlation*

*n = number of p's in group or average cluster size (i.e. a pair: 2)*

A power calculation showed that to detect a large effect we would need 52 participants. Multiplying the sample size by the intra-class correlation gives a new sample size of 84 participants for a large effect. Therefore, we decided upon a sample size of 170 (85 pairs) for the current study to detect a medium to large effect. However, 8 participants were excluded before testing took place due to inclusion criteria.

## Design

The study was a between subject design. Each pair specified which alcohol (beer/white wine) they would prefer to consume in the study prior to arrival (both participants had to consume the same alcohol type) and the pair were randomly assigned (stratified by same gender and mixed gender pairs) to either the labelled glass or non-labelled glass condition.

## Questionnaire Measures

*Pair Relationship Information (PRI, see Appendix 11)* (Dallas et al., 2014*).* This is an instrument to gain information on the degree of friendship between pairs. Questions included how long participants have known each other (given in months or years), how close they are as friends, how much time they spend together, how well the pairs know each other and how similar they are to each other (5 point Likert-scaled response, 'strongly agree' to 'strongly disagree'). Points on the Likert scale were totalled to obtain an overall score for relationship 'closeness', with a lower score indicating greater closeness.

*Alcohol Use Disorders Identification Test (AUDIT, see Appendix 1 and page 32 for full description)* (Saunders et al., 1993). The AUDIT is a clinical screening tool designed to pick up the early signs of hazardous drinking (Babor et al., 2001).

*Timeline Follow Back Questonnaire (TLFB, see Appendix 2 and page 33 for a full description)* (Sobell & Sobell, 1992). The TLFB is a self-report measure which estimates weekly alcohol consumption in UK units and binge frequency (binge defined as: ≥8 units p/drinking episode in men, ≥6 units p/drinking episode in women [NICE, 2010]).

*Readiness to change contemplation ruler (RTC ruler, see Appendix 3 and page 34 for a full description)* (LaBrie et al., 2005). The contemplation ruler is a single item continuum measuring from 0-10 with 0 representing the statement 'I never think about my drinking' and 10 representing the statement 'My drinking has changed. I now drink less than before'.

Materials

*Drink Wise glass (see Figure 4.1).* The unit measure glass was introduced as a tool by Drink Wise to calculate how many units are in a variety of drinks, and it has measurement marks accurately showing the number of units in common drinks of a given %ABV (e.g. wine 125ml 12% = 1.5 units). It contains daily guidelines for men and women (3-4 units a day for men and 2-3 units a day for women) and a health warning: 'regularly exceeding these guidelines could lead to serious health problems'. The total volume of the glass is 340ml.


*Figure 4.1. Drink Wise glasses*

Outcome Measures

*Alcohol consumption & Taste test* (*see Appendix 12)* (Jones, Rose, Cole & Field, 2013). Participants were provided with preferred alcohol (880ml beer or 500ml wine) and the main outcome measure was amount consumed (units). To disguise this measure, participants were asked to complete a taste rating assessment of the drinks consisting of a 10 point Likert scale of the following attributes: 'fruity', 'smooth',

‘sweet’, ‘refreshing’, ‘bitter’, ‘strong tasting’, ‘gassy’, ‘pleasant’, ‘light’, ‘tasty’. Taste ratings were not analysed.

*Alcohol Urge Questionnaire (AUQ, see Appendix 9 and page 57 for a full description)* (Bohn et al., 1995). This is an eight-item state measure that assesses the urge for an alcoholic drink at the time the questionnaire is completed, and is therefore a measure of acute craving. Items are scored across a 7 point Likert Scale from ‘strongly disagree’ to strongly agree’.

*Drink Wise glass questionnaire (see Appendix 13)*: Those in the labelled glass condition were asked questions regarding the glass: 1. ‘Did you notice the warning and unit labels?’ 2. ‘Do you think it had an effect on how much alcohol you consumed?’ 3. ‘Do you think these glasses could be useful in getting people to drink less?’

Procedure

Testing took place in a semi-naturalistic bar-laboratory. All participants were required to provide a zero breath alcohol reading prior to the study session. Participants gave informed consent, completed the battery of questionnaire measures (PRI, AUDIT, TLFB, RTC, baseline AUQ) before completing the main experimental task. Participants were provided with their own jug of beer or carafe of wine (both participants were required to drink the same type of alcohol, chosen prior to study arrival). The alcohol provided was either 880 ml of beer (Fosters, 4% ABV, maximum consumption = 3.6 units/27.8 g of alcohol) or a 500 ml carafe of white wine (Black Tower light white wine, 5.5% ABV, maximum consumption = 2.8 units/ 21.7g of alcohol). These drink options were chosen to ensure that participants could consume a reasonably high volume of alcohol without consuming a high number of units, they are also drinks consumed commonly and used in other similar studies (e.g. Dallas et al., 2014; Larsen et al., 2010). Participants were provided with either a labelled Drink Wise glass or a non-labelled glass of exactly the same size and shape (volume: 340ml). Participants were instructed to pour the alcohol into the glass and consume as much as they wanted to, it was stressed that they must only consume alcohol from their own container. To ensure this instruction was followed participants were told they would be videoed during the experiment. To disguise the true aims of the study the pairs were told that there would be a taste test after the

session and were given a sociability task, with discussion questions surrounding recent news headlines, to create a usual pub-like conversation. The researcher left the lab to ensure participants felt comfortable in the drinking environment and checked the experiment was running smoothly at regular intervals. After a 20 minute experimental period participants were required to fill out the taste test form. Participants then completed a second AUQ measure and those in the labelled glass condition completed questions regarding the glasses to gain an insight into whether they had noticed and used the labels. Participants were then breathalysed again, before being debriefed and compensated for their time. If participants' breath alcohol concentration scores were over 0.17mg/l (half the U.K. legal driving limit), they were advised to stay in the laboratory or signed a waiver to confirm they were aware of their level of intoxication. Left over drinks were measured to calculate the amount of alcohol consumed by each participant.

### 4.4 Results

Analysis

Research into dyadic interactions shows two individuals' drinking behaviour becomes synchronised when drinking alcoholic beverages, shown by imitation of sips (Larsen et al., 2010; Larsen et al., 2012b). It is suggested that individuals may (non-consciously) monitor others' and their own drinking behaviour to keep up a similar drinking pace. This indicates that when consuming alcohol with a peer, the amount of alcohol consumed is likely to be similar. Due to this an individuals' drinking behaviour is nested within a pair, therefore in the current study a multilevel random intercepts model was used for analysis, conducted in MLWin2.3 (Rasbash, Charlton, Browne, Healy & Cameron, 2010). The dependent variable was the amount of alcohol consumed (units), we examined whether the independent variable (labelled/non-labelled) and individuals' drinking characteristics (weekly unit and binges, AUDIT scores, RTC, baseline AUQ) were related to the amount of alcohol consumed (primary outcome). We also measured whether the independent variable (labelled/non-labelled) was related to change in alcohol urge (secondary outcome). We expected those in the labelled glass condition to drink fewer units and have a smaller increase in urge, and that those with lower weekly consumption, lower AUDIT scores, a higher RTC and a lower AUQ would drink fewer units.

Participant Characteristics

Descriptive statistics are presented in Table 4.1. MANOVA indicated groups did not statistically differ on any of these factors (ps> 0.10). The sample was made up of 90.75% risky drinkers, identified by an AUDIT score of 8 or above (Babor et al., 2001). Groups did not differ in percentage of risky drinkers, [$\chi^2(1, N = 162) = 0.37$, p=0.54]. The mean score on the RTC ruler was 3.38 (SD ±2.72) this score lies between 'sometimes I think about drinking less' and 'I have decided to drink less'.

Of the participants, 2 guessed the aim of the study. When conducting the analysis with and without these participants, findings did not differ, so they were included in the final sample.

**Table 4.1. Means (±SD) for participant characteristics by condition (N=162)**

| | *Mean scores(±SD)* | | | *MANOVA* | |
|---|---|---|---|---|---|
| | *Labelled (82)* *Female (43)* *Male(39)* | *Non-labelled (80)* *Female (41)* *Male (39)* | *Overall (162)* *Female (84)* *Male (78)* | | |
| Variable | | | | *F* | *p* |
| Age (y) | 22.06 (3.39) | 22.37 (3.87) | 22.21 (3.63) | 0.64 | 0.43 |
| RTC ruler (0-10) | 3.18 (2.81) | 3.58 (2.63) | 3.38 (2.72) | 1.06 | 0.31 |
| AUDIT (0-40) | 13.55 (4.86) | 14.71 (5.79) | 14.13 (5.35) | 1.64 | 0.20 |
| Weekly units (TLFB) | 26.58 (17.25) | 26.25 (15.13) | 26.42 (16.19) | 0.00 | 0.10 |
| Weekly binge (units) | 1.62 (1.13) | 1.54 (0.96) | 1.58 (1.05) | 0.23 | 0.63 |
| Baseline AUQ (1-7) | 3.81 (1.14) | 3.94 (1.15) | 3.87 (1.14) | 0.46 | 0.50 |

TLFB = Time Line Follow Back; AUDIT = Alcohol Use Disorders Identification Test; RTC ruler: Readiness to Change Ruler; Weekly binge = number of binge drinking episodes per week; baseline AUQ: Alcohol Urge Questionnaire

## Alcohol Consumption

See table 4.2 for drinking data. Males consumed significantly more alcohol (M = 2.05, SD ±0.82) than females (M = 1.29, SD ±0.62), [F (1, 161) = 44.24, $p < 0.001$, $\eta_p^2 = 0.28$]. There was an intra-class correlation (ICC) of r = 0.80, p = 0.001, indicating that the majority of the variance was between pairs.

**Table 4.2. Alcohol consumption data (unit M±SD)**

| | Labelled | Non-labelled | Overall |
|---|---|---|---|
| All participants | 1.62 (±0.83) | 1.69 (±0.82) | 1.66 (±0.82) |
| Males | 2.06 (±0.80) | 2.04 (±0.86) | 2.05 (±0.82) |
| Females | 1.23 (±0.63) | 1.36 (±0.61) | 1.29 (±0.62) |
| Beer | 1.45 (±0.75) | 1.73 (±0.67) | 1.59 (±0.72) |
| Wine | 1.80 (±0.87) | 1.65 (±0.94) | 1.73 (±0.90) |

## Multilevel Models

Data was organised into two levels, with individuals nested in pairs. Level 1 predictors were drinking characteristics of individuals: weekly units (weekly binge was not included in the models due to high multicollinearity with weekly units), AUDIT, RTC ruler and baseline AUQ. The Level 2 predictor was the condition (labelled/non-labelled) that the pair was in.

*Alcohol consumption (primary outcome, see table 4.3)*

Four models were tested. In model 1 only the level 2 predictor (condition) was included, and there was no significant main effect of condition, indicating participants did not differ in their drinking by glass type. In model 2 (full model) all level 1 predictors and the level 2 predictor were included. This model was tested against another model (model 3) that included the significant level 1 predictors (weekly units [$\beta$ =0.01, z = 2.25, p = 0.01], AUDIT [$\beta$ = 0.02, z = 1.73, p = 0.04], baseline AUQ [$\beta$ = 0.02, z = 3.33, p = 0.001]) and the level 2 predictor. The significant main effects indicate those who had higher weekly units, AUDIT scores and baseline AUQ consumed more alcohol in the experiment. Goodness of fit analyses showed that this parsimonious model (3) was a significantly better fit than model 2, [$\chi 2$ (2) = 1.29, p = 0.28]. Model 3 was a significant improvement on model 1; [$\chi 2$ (3) = 22.99, p < 001]. Therefore adding weekly units, AUDIT scores and baseline AUQ makes a better fitting model.

This model was also compared to a model (4) with only the significant level 1 predictors. Goodness of fit analysis showed that the model with only the significant main effects of weekly units [β =0.01, z = 2.25, p = 0.01] and AUDIT [β =0.02, z = 1.73, p = 0.04] was a better fit than the same model (3) with condition, [$\chi 2(1) = 0.08$, p = .98]. This indicates that the addition of condition does not significantly improve the models. Adding interactions (condition x drinking characteristic) did not significantly improve the model, all ps>0.24.

*Alcohol urge (secondary outcome)*

An AUQ change score (post drink AUQ – baseline AUQ) was calculated and entered in to a model with the level 2 predictor (condition). There was no significant main effect of condition on change in alcohol urge [β =0.02, z = 2.22, p = 0.41].

Therefore, there were no significant effects of the labelled glasses on alcohol consumption. There were significant main effects of weekly units, AUDIT and baseline AUQ, with those who drank more in the week prior to the study, with a higher AUDIT score and higher baseline AUQ consuming more alcohol in the experiment.

**Table 4.3. Multilevel analyses on alcohol consumed, by condition and drinking characteristics**

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| | β (SE) | β (SE) | β (SE) | β (SE) |
| Fixed effects | | | | |
| Constant | 1.69 (0.12) | 1.20 (0.19) | 1.11 (0.18) | 1.11 (0.16) |
| Labelled/non-labelled | -0.06 (0.16) | -0.05 (0.16) | -0.03 (0.15) | |
| Weekly units | | **0.01 (0.004)*** | **0.01 (0.004)*** | **0.01 (0.004)*** |
| AUDIT | | **0.02 (0.01)*** | **0.02 (0.01)*** | **0.02 (0.011)*** |
| RTC ruler | | -0.02 (0.02) | | |
| Baseline AUQ | | **0.02 (0.01)***** | **0.02 (0.01)***** | **0.02 (0.01)***** |
| Random effects | | | | |
| Pair variance | 0.42 (0.09) | 0.31 (0.07) | 0.31 (0.07) | 0.31 (0.23) |
| Subject variance | 0.25 (0.04) | 0.23 (0.04) | 0.23 (0.04) | 0.23 (0.04) |
| -2loglikelihood | 353.00 | 328.82 | 330.01 | 328.82 |

p < .05, *p < .01, **p <.001***

Pair Relationships (see figure 4.2)

A significant main effect of relationship closeness and alcohol consumption was found, [β =-0.06, z =-1.67, p = 0.05], with pairs who perceived their relationship as 'closer' consuming more alcohol. There was no significant main effect of the length of time participants had known each other.

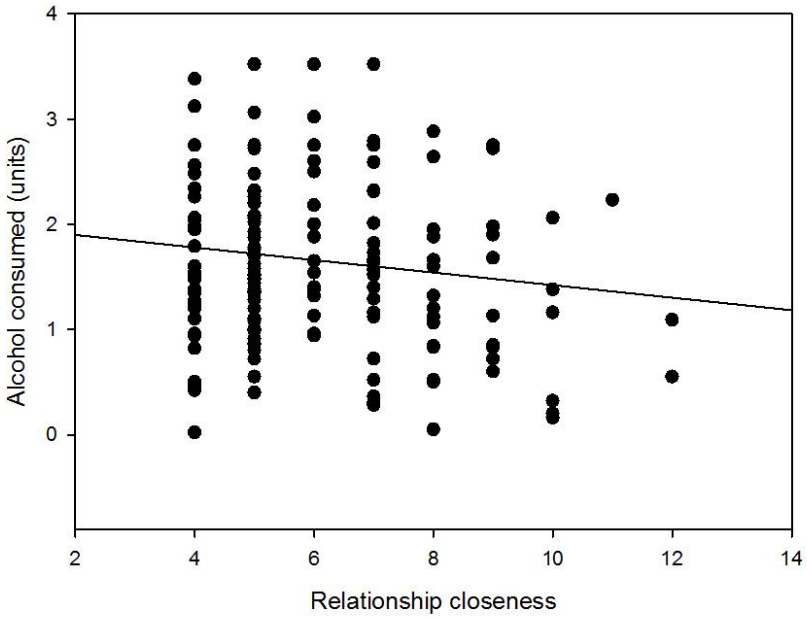
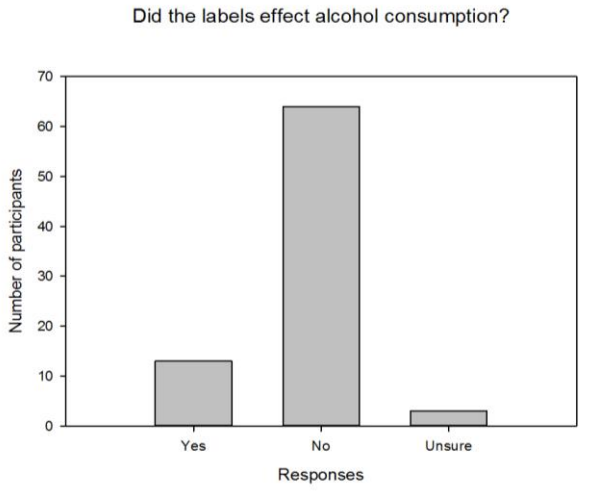
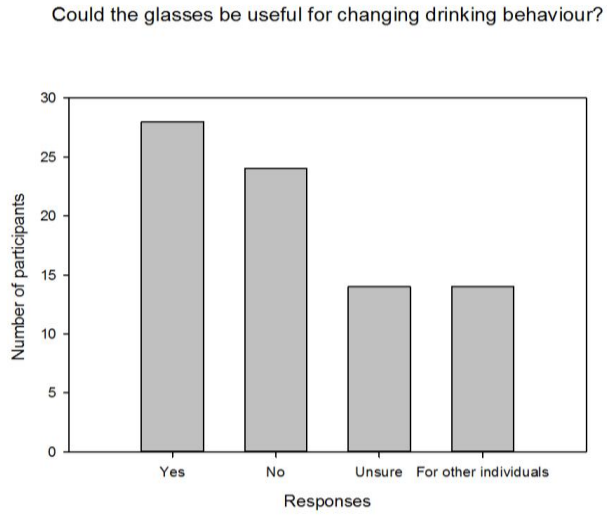


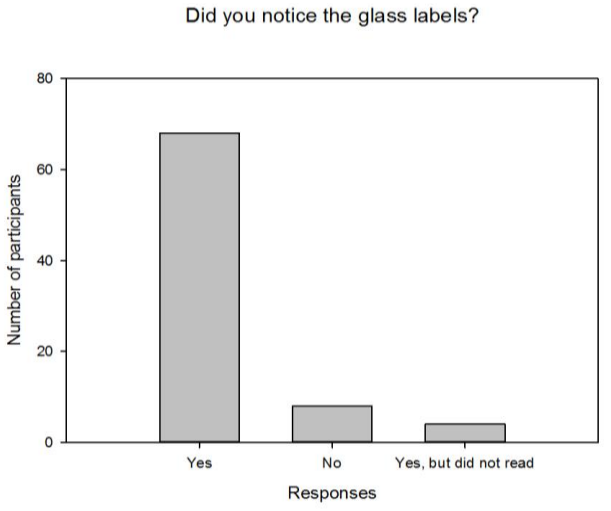

*Figure 4.2. Relationship closeness by alcohol consumed*

Drink Wise glasses questions

Participants were asked questions regarding the Drink Wise glasses. These are presented in Figures 4.3-4.5. Answers indicated that 85% of participants noticed the warning and unit labels on the glass, 10% did not notice the labels and 5% noticed the labels but did not read them. When asked if they believed whether the glasses had an effect on the amount of alcohol they consumed, 16.25% answered ‘yes’, 80% answered ‘no’ and 4.75% of participants were ‘unsure’. In terms of their potential for getting individuals to drink less, 35% believed they could be useful, 30% did not, 17.5% were unsure and 17.5% of participants believed they would be useful for certain people.




*Figures 4.3, 4.4 and 4.5. Drink Wise glasses questions*

### 4.5 Discussion

This study was the first to investigate the effect of warning labels and unit information on the side of a glass. The results showed that there were no significant effects of the Drink Wise glasses on ad libitum alcohol consumption over a 20-minute period in a semi-naturalistic bar-laboratory. There were significant main effects of weekly unit consumption AUDIT scores and baseline AUQ, indicating that those with a higher weekly intake, hazardous drinking scores and urge for alcohol, drank more in the bar-lab. There were no other main effects and there were no interactions with any other drinking characteristic.

The significant main effect of weekly units and AUDIT scores indicates that those with a higher consumption and more alcohol problems in the study reported drinking more units the week before the study. This is supported by other studies showing participants with a high weekly unit consumption consume more alcohol in a lab environment (Koordeman, Anschutz & Engels, 2014).

This study tested whether information could influence drinking when provided at the point of consumption (e.g. on the drinking glass). Findings indicate that information provided at this point provided no benefit in reducing ad libitum alcohol consumption over a 20-minute period in a realistic drinking situation. The Government's Alcohol Strategy (2012) and the majority of the Public Health Responsibility Deal (RD) pledges propose interventions that favour information and communication and one of these pledges is alcohol labelling (Knai et al., 2015). Labelling is described by Hollands and colleagues (2013) as a choice architecture intervention; it alters the properties of an object within an environment by providing information on a product. UK government regulations require health-warning labels on alcoholic beverages, which give details on unit content and safe daily limits for consumption (Wilkinson & Room, 2009). The provision of information and warnings in the form of alcohol labels have been shown to have minimal to no impact on behaviour, and overall are ineffective at reducing alcohol consumption in their current form (Wilkinson & Room, 2009; Knai et al., 2015). Such interventions assume consumers with full information will act in their own best interests; however, giving information about the risks of a particular behaviour may not be sufficient to result in behaviour change.

The majority of the sample were risky drinkers (over 90%), based on an AUDIT score of 8 or above (Babor et al., 2001), and were placed in the hazardous drinking category (between 21-50 units for men and between 14-35 units for women [IAS, 2013a]) based on their unit consumption (M = 26.42). Those who drink above the guidelines have less knowledge of guidelines and health risks (Cotter et al., 2013); therefore in theory providing these guidelines should have been of benefit to this population. However, there are a number of reasons that may explain why they were ineffective.

Specific characteristics of the Drink Wise glass may help explain why the labels did not have any effect on drinking behaviour. Firstly, the information provided on the glass is very similar to the information that is given in the UK on a beverage container, and therefore many of the participants will have seen this and similar information numerous times before. It has been suggested that the tedium of additional repetitions of a message may lead to reduced attention to health warnings and a weakened impact on attitude change (Haugtvedt, 1994). Therefore, a novel message may be more effective in ensuring the information is processed. For example alcohol policy could follow tobacco's example, as in 2008 pictorial warnings were introduced on cigarette products (TMA, 2008), and evidence shows these larger pictorial health warnings are significantly more effective than smaller text-only messages (Hammond, 2011). Furthermore, requiring participants to engage with the information on the Drink Wise glass may have made the message more salient. Previous research has shown that engaging with alcohol-related information can lead to reductions in drinking (Clarke, Field & Rose, 2015) as simply noticing the information does not necessarily mean one has processed it. However, the current studies were developed to test interventions in a more realistic way and drinkers would not be required to engage with glasses in real-world drinking situations.

Secondly, the concept of a unit is often not well understood and it may be that participants have a lack of awareness of its significance (Martin-Moreno et al., 2013). Future research should assess baseline knowledge of units and their relation to health risks. Furthermore the warning on the glass states that 'regularly exceeding these guidelines could lead to serious health problems', this gives no indication of the type of health risk and suggests the health risks are long-term. Drinkers (especially heavier drinkers) have an inability to recognise the longer-term impact of

drinking; suggested to be due to either a knowledge deficit or self-exempting beliefs (Cotter et al., 2013). In a young heavy drinking population, short-term risks associated with intoxication may be more relevant (e.g. weight gain). Provision of information that this population place more significance on (e.g. nutritional information) may have an increased potential to reduce consumption. Currently no country in the world requires nutritional information or calories on packaging, a surprising fact considering alcohol's high calorie content (Martin-Moreno et al., 2013), therefore future research should assess the impact of this type of information.

After the study, participants were asked questions regarding the Drink Wise glasses and their view of them as a potential harm-reduction method. Findings from these questions support the main findings of the study. Although 85% of participants noticed and read the unit labels on the glass, only 16.25% believed this had an effect on the amount of alcohol they consumed. This shows participants did notice the labels on the glass yet they did not believe it influenced their drinking behaviour. The majority of participants said they could be useful in getting people to drink less, with 14% specifying that this was only in certain people. This suggests in different populations the Drink Wise glasses may be of more use and future research should assess their impact in various populations (e.g. different ages, heavier drinkers, those wanting to change).

There was a high correlation between drinking speeds of individuals in each pair, indicating a modelling effect. Modelling refers to adapting drinking levels to the consumption of other people (Bot, Engels., Knibbe & Meeus, 2007), and there is robust evidence for this effect (e.g. Bot et al., 2007; Larsen et al., 2010; Dallas et al., 2014). This may be particularly true for social acquaintances, as they tend to be similar (Leonard Kearns & Mudar, 2000). Therefore, we investigated the effect of friendship level on drinking rate. Participants were asked questions to determine how close they were as friends and how much time they spent together. Study findings indicated a significant main effect of relationship 'closeness', those that perceived their friendship to be close consumed more alcohol. This may be because these pairs are used to drinking together, therefore may feel more comfortable consuming higher levels of alcohol.

A limitation of this study is that the period of time spent drinking was moderately short as participants consumed levels of alcohol that were within safe daily limits (an average of 1.6 units). However, if participants were to continue at this drinking rate for an hour this would equate to 4.86 units, over the daily average for both males and females. Consequently, even a reduction over a short period of time would indicate potential benefits for the consumption of alcohol over a longer period.

This study is novel, as it used a glass that is available from Drink Wise for use as a potential alcohol reduction tool. This is the first investigation of the impact of having unit labels and warnings on the side of the glass on ad libitum drinking. Study findings suggest that in the current population these glasses provide no benefit in reducing drinking over a short-term period. It is suggested that this could be due to the content of the information provided on the glass. The provision of such information is supported by the Government's Alcohol Strategy yet it is not supported by evidence and current study findings. Information provision is important regardless of its impact on behaviour change, yet as a standalone intervention it is not effective in its current form, even when provided at the moment of consumption.

# Chapter Five (Study Four)

## The effect of glass labels on alcohol consumption: a qualitative investigation

This Chapter is supplementation to the quantitative findings from Chapter Four, drawing on findings from two focus group interviews to present social drinkers' (N= 17) perspectives and experiences on their own drinking behaviour and their views on the potential use of the Drink Wise labelled glass as a harm-reduction method.

## 5.1 Abstract

This exploratory qualitative study investigated the views of UK social drinkers on their alcohol consumption, motives for drinking, existing knowledge of alcohol guidelines and their views on the use of labelled Drink Wise glasses as a potential tool to reduce drinking. Two focus groups (N = 17) were conducted with a young adult population. A battery of questionnaires measured drinking habits, alcohol-related problems, readiness to change, and drinking motives. Findings indicate that heavy social drinking was common, and pre-drinking was often reported as a method to reach the desired level of 'controlled intoxication'. Participants were most likely to drink for social reasons, enhancement and to increase confidence. There was a reasonable level of knowledge of current drinking guidelines, yet these were not often utilised to guide behaviour. Some participants showed support for the glasses and thought they could be useful, but most participants indicated that they would be reluctant to use the glasses; reasons given were the content of the information and the aesthetics of the glass (i.e. their shape and style). This indicates that in a young adult population alternative strategies may be necessary to change harmful alcohol consumption behaviour, such as the provision of information that is relatable.

## 5.2 Introduction

Given the findings from Study Three (reported in Chapter Four), that the information/warnings on Drink Wise glasses did not affect drinking behaviour in a naturalistic setting, two focus groups were conducted to elaborate on and better understand these quantitative findings. The focus groups' main aims were to examine perceptions and opinions of the Drink Wise glasses and provide a unique insight into a young adult population's views on this particular type of harm-reduction strategy. A further aim was to gain an insight into the drinking habits and motives of students. The sample of participants (majority students) were typical to those used throughout the current studies, therefore it is of worth to investigate their patterns of drinking in order to support and further explain quantitative findings. The mixture of quantitative and qualitative methods to investigate this strategy gives a thorough and unique analysis that provides complementary results (Fraeymen et al., 2012).

Focus group interviews are a data collection method with an interactive approach that generates detailed information about certain topics chosen by the researcher. A supporting environment is created, with simple questions developed to encourage discussions and raise issues that otherwise may not have been identified (NyGaard & Paschall, 2012). Focus groups give in-depth qualitative information and are a valuable method for exploring the complexity of experiences, opinions and perspectives (Fraeyman, Van Royen, Vriesacker, De Mey & Van Hal, 2012). Compared to in-depth interviews they can allow for better reflection on collaborative experiences (Lunt & Livingstone, 1996). As outlined in Chapter Four (Study Three), there are several reasons why the Drink Wise glasses may not have successfully reduced drinking. These included the characteristics of the Drink Wise glass (e.g. aesthetics) and the content of the information on the labels. The aim of the present study was to explore these issues and clarify the results of Study Three as well as gaining a more descriptive insight into the drinking habits and motives of this population.

## 5.3 Method

### Participants

Seventeen social drinkers (8 females; mean age 21.46 yrs [SD ±7.16]) were recruited from the University of Liverpool via advertisements, word of mouth and using the university's online EPR system, to take part in one of two focus groups, which were single sex. Groups were separated by gender as it is reduces any problems of intergender dynamics (Hopthrow, Abrams, Frings & Hulbert, 2007). For example, it is often recommended against mixing gender in focus groups as there is some evidence that it can lead to greater conformity in the group (Litosseliti, 2003). It is also possible that with the discussion of alcohol use and motives, sensitive issues (e.g. sexual activity) may have been discussed and other research discussing similar topics have used single sex groups (Lindgren, Pantalone, Lewis & George, 2009). Inclusion criteria were fluency in English and a social drinker, i.e. weekly consumption of alcohol (mean weekly unit consumption: 15.64 [SD ±11.98], UK alcohol unit = 25ml of a standard spirit = 8 grams of pure alcohol). An exclusion criterion was participation in the experimental Drink Wise glasses study (Study Three). All participants provided informed consent before taking part in the study and received £5 reimbursement as compensation for their time. The study was approved by the University of Liverpool Research Ethics Committee.

### Design

A qualitative focus group methodology was employed. Two focus groups (one male and one female group) were carried out.

### Questionnaire Measures

These measures were taken after participation in the focus group to provide descriptive quantitative data on the alcohol consumption behaviour and drinking motives of the participants.

*Alcohol Use Disorders Identification Test (AUDIT, see Appendix 1 and page 32 for full description)* (Saunders et al., 1993). The AUDIT is a clinical screening tool designed to pick up the early signs of hazardous drinking (Babor et al., 2001).

*Timeline Follow Back Questonnaire (TLFB, see Appendix 2 and page 33 for a full description)* (Sobell & Sobell, 1992). The TLFB is a self-report measure which estimates weekly alcohol consumption in UK units and binge frequency (binge defined as: ≥8 units p/drinking episode in men, ≥6 units p/drinking episode in women [NICE, 2010]).

*Readiness to change contemplation ruler (RTC ruler, see Appendix 3 and page 34 for a full description)* (LaBrie et al., 2005). The contemplation ruler is a single item continuum measuring from 0-10 with 0 representing the statement 'I never think about my drinking' and 10 representing the statement 'My drinking has changed. I now drink less than before'.

*Modified Drinking Motives Questionnaire- Revised (DMQ-R, see Appendix 14)* (Grant, Stewart, O'Connor, Blackwell & Conrad, 2007). The concept of drinking motives is based on the assumption that individuals drink in order to attain certain valued outcomes and that drinking behaviour is motivated by different needs or serves different functions (Kuntsche et al., 2005). The DMQ-R is a 28 item, five factor measure of drinking motives. This is a modified version of Cooper's (1994) initial four factor drinking motives questionnaire that divides drinking to cope into two categories: drinking to cope with anxious feelings and drinking to cope with depressed mood. Each item on the DMQ-R contributes to one of five subscales: social, coping-anxiety, coping-depression, enhancement, or conformity. Participants take into consideration all the times they drink and indicate how often they drink for the reason specified in each item on a 5-point Likert scale ranging from 1 (almost never/never) to 5 (almost always/always). Each sub-scale is scored by calculating the mean of the responses for each of the items within it. Motives are categorized according to two dimensions: type of reinforcement (positive or negative) and source of reinforcement (external or internal). The external motives include positive-reinforcement social and negative-reinforcement conformity motives. The internal motives include positive-reinforcement enhancement and negative-reinforcement coping (coping-anxiety and coping-depression).

The Modified DMQ-R subscales show good to excellent test-retest reliabilities ($\alpha$ =0.69 to 0.91) in an undergraduate sample of relatively frequent drinkers, with each

of the five types of drinking motives predicting a distinct pattern of alcohol use and alcohol problems (Grant et al, 2007).

Procedure

Participants were recruited using a convenience sampling method through advertisements, the university online EPR system and word of mouth. Participants were required to participate in one of two focus groups (split by gender). Each focus group lasted no longer than one hour. The focus groups were held in closed rooms on the University of Liverpool campus.

Upon arrival, participants were each given an information sheet and provided written informed consent. They were informed that the focus groups would remain strictly confidential and were each given a number before recording began so that they could not be identified by name. They were informed that discussions would be recorded and transcribed. A semi-structured interview guide of open questions was used to stimulate discussion and obtain opinions and perspectives of participants. The focus groups were facilitated by a researcher whose role was to consider participants' responses and reactions to conversation, to signal approval and to remain open (Gronkjaer, Curtis, De Crespigny & Delmar, 2013). Participants were asked questions that concerned their drinking behaviour and motives for drinking, their current knowledge and use of drinking guidelines, and opinions on the Drink Wise glasses. At certain points in the focus groups materials were used. The Drink Wise glasses were introduced with the questions regarding them (see Appendix 15). All focus groups were audio recorded and detailed notes were taken by an observer. After the focus groups had taken place participants were then given the questionnaire battery to complete and were fully debriefed. The session was transcribed immediately after.

## 5.4 Results

Analysis

Focus groups were transcribed verbatim and analysed using NVivo 10, a qualitative analysis software (NVivo, 2010). The data set was analysed using thematic analysis, which involves familiarisation with the text, the identification and coding of themes relevant to the study purpose, the connection of categories and interpretation

(Gronkjaer et al., 2013). The coding process is a dynamic process between the coder and the text during which themes of interest are developed, refined and coded (NyGaard & Paschall, 2012). The initial coding was undertaken by the main researcher (author) and was supported by a second researcher for reliability purposes. This Chapter is a full report of the themes that emerged.

In the subsequent theme description (based on Penny & Armstrong-Hallam, 2010), italics are used to present participants' comments verbatim and the use of a dotted line is used to represent material that has been excluded from the quote.

Participant Characteristics

Descriptive statistics are presented in table 5.1. MANOVA indicated groups did not statistically differ on any of these factors (ps> 0.09). The sample was made up of 64.71% risky drinkers, identified by an AUDIT score of 8 or above (Babor et al., 2001). Groups did not differ in percentage of risky drinkers, [$\chi^2$ (1, N = 17) =0.03, p=0.86]. The mean score on the RTC ruler was 4.06 (SD ±3.29) this score lies between 'sometimes I think about drinking less' and 'I have decided to drink less'. The current study had significantly lower values for weekly units (p = 0.03), weekly binges (p = 0.03) and AUDIT scores (p = 0.04) compared to Study Three drinking characteristics. Study samples did not significantly differ on RTC scores (p = 0.58).

*Drinking Motives*: For the DMQ-R subscales participants were highest on the social subscale, followed by enhancement, then coping-anxiety, then conformity, then coping-depression.

**Table 5.1. Means (±SD) for participant characteristics overall and by gender (N=17)**

| | *Mean scores(±SD)* | | | *Statistics (MANOVA)* | |
|---|---|---|---|---|---|
| Variable | *Female (8)* | *Male (9)* | *Overall (17)* | *F* | *p* |
| Age (y) | 20.00 (1.00) | 22.38 (9.21) | 21.46 (7.16) | 0.65 | 0.43 |
| Weekly consumption (units) | 13.26 (11.12) | 17.74 (12.97) | 15.64 (11.98) | 0.58 | 0.46 |
| Weekly binge (units) | 0.63 (0.79) | 0.67 (0.61) | 0.65 (0.68) | 0.02 | 0.90 |
| AUDIT (0-40) | 10.63 (4.31) | 11.11 (5.23) | 10.88 (4.68) | 0.04 | 0.84 |
| RTC Ruler (0-10) | 4.50 (3.55) | 3.67 (3.20) | 4.06 (3.29) | 0.26 | 0.62 |
| *DMQ-R:* | | | | | |
| Social (1-4) | 3.82 (0.60) | 3.00 (1.16) | 3.39 (1.01) | 3.25 | 0.09 |
| Coping-anxiety (1-4) | 2.5 (0.74) | 2.33 (1.22) | 2.41 (0.10) | 0.11 | 0.74 |
| Coping-depression (1-4) | 1.43 (0.47) | 1.49 (0.77) | 1.46 (0.63) | 0.04 | 0.84 |
| Enhancement (1-4) | 3.13 (0.85) | 2.51 (1.25) | 2.80 (1.10) | 1.36 | 0.26 |
| Conformity (1-4) | 1.33 (0.34) | 1.98 (0.95) | 1.67 (0.78) | 3.37 | 0.09 |

AUDIT = Alcohol Use Disorders Identification Test;; RTC ruler: Readiness to Change Ruler; Weekly binge = number of binge drinking episodes per week, Modified DMQ-R = Modified Drinking Motives Questionnaire

Main themes

Data was coded into four main themes: drinking habits and patterns, motivation for drinking, alcohol-related information and knowledge, and opinions of the Drink Wise glasses. These reflect the initial topic areas identified for investigation.

**Drinking habits and patterns**

In this section, the patterns in which respondents use alcohol and their consumption behaviour are investigated. Five subthemes were identified: quantity and frequency of drinking alcohol, controlled intoxication, context of drinking, change in drinking since coming to university, and pre-drinking. Controlled intoxication (in the drinking patterns subtheme) and drinking to get drunk (in the motivations for drinking sub theme) share similarities, but a desire for intoxication explains both the pattern of consumption behaviour and was a reason for their use of alcohol, therefore they are separated into two separate subthemes.

1. *Quantity and frequency of drinking alcohol*

Participants varied in the description of their drinking patterns. Some described themselves as a light or moderate drinker, *'I'm a light drinker too, moderate actually, I only drink at weekends I don't drink during the week at all'.* Drinking levels depended on the kind of night *'if I'm going out, I'll probably drink quite a lot but if I'm just going to the pub I might have 2 pints'*.

Others reported consuming very high amounts of alcohol, drinking significantly over government daily guidelines '*I'd have about 6 shots of vodka and 7 cans of beer and then some more on the night out, like a cocktails or something'* and *'35cl of vodka before going out and then just one or two drinks while I'm out'.* Some reported mixing their drinks, starting with lower strength alcoholic beverages such as beers and moving on to stronger drinks such as spirits *'I usually share a crate at pre drinks, have about 5 or 6, and then when I'm out I do shots all night'* and '*I'd probably start on pints and cocktails and then go on to spirits'.*

In terms of frequency, the majority of participants appeared to drink heavily on one or two nights a week rather than daily, as when asked how often they consumed alcohol they reported *'twice a week', '2 or 3 times a week'.* Others showed even more sporadic pattern*s 'mine's very varied, I'd probably go out and not drink for a whole night, and then probably since last week I've had probably the heaviest drinking I've ever had'.*

2. *Controlled intoxication*

Participants discussed their limits for drinking, and learning their limits in order to reach and maintain a certain level of intoxication *'so I don't think I stop drinking until I'm drunk'*. Going over the limit was viewed negatively '*I think everyone has an ideal level of drunkenness and sometimes they go over that and you're terribly sick'*. One participant felt that personal limits were the best way to gauge a safe amount of alcohol, and that recommended guidelines were only there for those that did not know their limits, rather than the guidelines being in place for potential health risks, *'I think the guidelines more apply to those that don't necessarily understand their limits'.*

There was variability in limits between and within individuals. Participants described how individuals have differing limits *'people have different limits. Like, for instance, myself. If I was to drink maybe 5 shots with 2 mixers I think I would be completely smashed. But I see people who have that and they have 5 more beers'*. Some participants mentioned that their limits had increased *'I have quite a high drinking tolerance now. I could drink a lot and it doesn't really affect me that much'*. Others said that their limits varied depending on the day, sometimes the intoxication may not be expected and was due to accidentally making drinks too strong *'sometimes you surprise yourself and you turn out drunker than you wanted to be but you've just mixed your drinks not very well'*. It was also dependent on the amount of food that had been consumed beforehand *'like if I know I've just had soup for tea, I know that I would get drunker much quicker, so I would maybe try and regulate my drinking a bit more. But, if I'd had something really stodgy, I think oh I've had that for tea so I will be more likely to drink more before the taxi comes, make the most of it'.* Therefore an aim for participants was to reach this ideal level, and remain there by finding a *'happy medium of just the right drunkenness'.*

3. *Context of drinking*

Drinking was mostly described as an activity for a social occasion, such as nights out, festivals, gigs and eating out. Specific drinks were associated with different occasions, for example cider at a festival or music event *'fits the atmosphere I do enjoy cider at a festival or a music gig'* and with food *'wine with a meal like a meal out with the girls you might have a bottle of wine'.* However, some participants associated drinking with a meal to be more common in older individuals *'my parents always drank with meals, whereas I hate drinking with meals, I prefer a lemonade rather than beer, I don't like the taste'*.

Drinking was not often carried out at home alone, *'never drank like on my own in front of the TV'.* Participants only referenced to home drinking if it was for 'pre-drinks' with a group of friends or a house party (see pre-drinking subtheme).

4. *Change in drinking since coming to university*

A change in drinking patterns since coming to university was highlighted by some participants. Those who mentioned this change said that their consumption had

increased *'since I've come to university I've definitely drank a lot more'*. This appeared to be particularly true during fresher's week and the initial years of university *'like in my first and second year of uni I drank a lot, third year not so much'*. The student drinking culture was described as something that is expected and inescapable *'I think you've got to really change the mentality, cos when you come into uni, it's synonymous, drinking… could I cope with the drinking culture in university. That was my main worry. …when you come to uni, you have to drink, everyone does it, if you don't you're not experiencing the student life'*.

5. *Pre-drinking*

Drinking at home was associated with pre-drinking, to load up on alcohol before going out. Pre-drinking was directed towards becoming intoxicated and involved drinking high amounts of alcohol ` *I usually share a crate at pre-drinks, have about 5 or 6, and then when I'm out I do shots all night'* and *'35cl of vodka before going out'*. Reasons given for this were to achieve the desired level of intoxication *'you would probably still drink the same amount cos you want to get the same drunkenness'* and to save money *'it's financially beneficial'*.

**Motivation for drinking**

Before this section of the schedule participants were given the DMQ-R to allow them to gain insight into possible common drinking motives. There were a variety of reasons given for participants' use of alcohol. Six subthemes were identified: drinking to get drunk, drinking for social reasons, drinking for enhancement, drinking to reduce anxiety and increase confidence, drinking to forget, and peer pressure.

1. *Drinking to get drunk*

One of the main motivators for consuming alcohol was to feel intoxicated *'I always drink to get drunk'*. Many mentioned that they disliked the taste of alcohol, but forced themselves to drink regardless '*now I drink wine, which I don't really even enjoy, but I just drink it because it gets me drunk'* or that they use mixers to cover up the taste of the alcohol, so that they can achieve their required drunken state without having to notice the taste '*I want to overpower the taste of it yer. Cos I don't really like the taste of it. I would rather not really notice it was there, I just want it to have*

*an impact on me'*. Certain drinks were used to achieve this more quickly or easily, such as spirits '*if I'm like drinking to get really really drunk I will drink vodka or rum'* or strong wine *'say if I'm looking for wine, I will always go for the strongest percentage, with the cheapest price'*.

2. *Drinking for social reasons*

Most participants reported drinking alcohol for social reasons, such as specific events and celebrations and alcohol was a central part of nights out, for example *'one big night scheduled in like someone's birthday, or a big celebration'*. It was emphasised that the consumption of high levels of alcohol was customary for certain celebrations, and that drinking was key to enjoyment of such events '*it's customary if everyone's celebrating one thing, to go out and drink a lot. Or people's birthdays or to celebrate the end of exams. Any excuse really. There's always an excuse to go out and celebrate something'*. Drinking was often carried out with family and friends as most participants would drink *'always with other people'*.

Alcohol was consumed as a method to increase an individual's own sociability as *'the more drunk you are (within reason) the more talkative and outgoing you are, which is good when you are meeting new people'*. Alcohol was described as a form of social lubrication, to make new friends, come across as more outgoing and fun. It was also used to increase the likelihood of romantic encounters, as one participant said that alcohol gives encouragement to *'kiss anybody'*. Not only was alcohol used to enhance sociability, but also to avoid awkwardness around new acquaintances *'I think, it just breaks the ice if everybody is drinking'*.

3. *Drinking for enhancement*

Alcohol was seen as a method to have an enjoyable time and a pleasurable experience. This was because of the positive feeling of intoxication *'I attach it with the feeling of feeling positive'* and *'because I like the feeling', 'it's really nice'*. However it was also because it encouraged participants to do things, that in turn made the night more enjoyable, for example you *'have a laugh and do things that you wouldn't normally do in the street and stuff like that'*.

It was also used to avoid aspects of the night that are not fun if you are not drinking, some participants mentioned the drinking environment itself, and that alcohol

prevents observing negative aspects of surroundings *'helps you forget about the sweat of all the clubs and all the dirt in it, you just embrace it a bit more; it is pretty horrible if you don't drink*'. Furthermore it prevents noticing others who are drunk *'if you're the only sober one everyone else is really annoying'*. Some participants felt there was no point in going out to clubs if you are not drinking *'you sort of feel out of place, I shouldn't be here. It's like join the club or leave'.* One participant mentioned that alcohol is so important to enhance a night that if they did not have it they would look to other methods or substances to achieve a similar enhancement *'I've got alcohol, but if I didn't have alcohol I know nights out wouldn't be as good so I'd look for other alternatives to make it better. It's sad, but that's sort of how it is'*.

4. *Drinking to reduce anxiety and increase confidence*

Participants emphasised that alcohol was used purposefully to reduce anxiety, especially in social situations that involved new interactions with people '*just because it was like there were new people, so it was nice to shed that anxiety'*, drinking was used to make conversation flow more readily *'it makes it easier to talk to people if you are a bit nervous'.* This was in situations where there were large groups of people, such as house parties, but one participant also mentioned using alcohol to calm down before a one-on-one meeting, such as a date '*yer, to reduce my anxiety as well in that sense I think. Or just the feeling of anxiousness before meeting somebody'.* Another participant also mentioned that there were bad sides to the increase in confidence intoxication can give, and that this can lead to doing things that they would not usually do when sober *'I almost think I am invincible when I do it as well, like I'm ten times better than I actually am. So I do stuff that like I wouldn't even dream of'.* Therefore the increase in confidence was not always viewed as a positive.

5. *Drinking to forget*

One participant mentioned that they used drinking to forget any stressful events that may have occurred in the week and to let go *'but I just do it because it gets rid of the stuff that has happened during the week that's been on your mind and just have a laugh'.*

6. *Peer pressure*

This subtheme describes the influence participants' feel from their fellow peers. This was sometimes experienced due to direct comments from friends which they wanted to avoid *'you just don't want that comment. Like 'oh why aren't you drinking?''*. It was also sensed through less direct means, a feeling of exclusion because everyone else is drinking *'there's an element that everyone else that does it influences what you do'*. One participant felt they have no choice when it came to whether or not they could drink *'I don't agree that you need it to have a good night. I would happily drink with friends around and just chatting and stuff. If I had a choice'*.

Pressure to drink was emphasised on certain occasions such as fresher's events '*in fresher's, we had drinking games and stuff, before we went out, and I think some people did feel pressured to see if they could down drinks'* and initiations in sports teams *'when I had the worst night of my life it was basically because it was a group initiation, and if you don't do it you are sort of left out'.*

**Alcohol-related information and knowledge**

This section focuses on participants' knowledge of drinking guidelines and the forms of information they pay attention to when choosing drinks and whilst drinking. Four subthemes were identified: knowledge of units, percentage of alcohol, calories in drinks and conflicting information.

1. *Knowledge of units*

There was great variation in existing knowledge of units. Some participants were reasonably knowledgeable on the number of units in drinks and correct guidelines. However, others were not and showed confusion *'erm a pint of beer 6 units? 2 units, 3 units? 4? 3?'.* Those that were knowledgeable gave different reasons for knowing the guidelines. Some had used online unit converters and this encouraged them to think in units *'I was like, oh, that's a lot, I've never thought about it in units, but now I think I definitely will'*. Others thought in units as they had carried out psychology alcohol-related experiments *'I think in units, but only because I've done quite a few of the psychology experiments'*.

Most did not consider units whilst drinking, but even if they did keep track, participants did not necessarily utilize units to reduce their drinking, this was generally because participants were drinking to reach their desired intoxication and were not aiming to keep within the recommended guidelines. *'I think it'd probably be good to know just to know how much you do drink… once I've reached the limit I would probably still carry on drinking if I didn't feel like I was drunk enough'.* This was because they were not concerned with reducing intake *'I'm not that concerned about cutting down my drinking I wouldn't like usually pay too much attention to them*'. Others did not use them as they viewed the guidelines as unrealistic *'I just think that's too low. That's actually quite unrealistic'* or too complicated '*it's a little bit complicated to work out. … I wouldn't just get a shot, I'd get a vodka, and coke, and sometimes when you order that they don't put a single in they put a double in and you're not sure. Wine can be different strengths, it might not always be 12%, it could be a bit complicated'*. One participant viewed guidelines as existing for certain drinkers, and that there should be different guidelines depending on the type of drinking pattern, for example those that drink once a week but drink a high amount on that drinking occasion *'so I think the guidelines are for someone who drinks every day, but doesn't drink that much. And there should be other guidelines as well for different types of drinkers'*.

2. *Percentage of alcohol*

Many participants that did not use units would look at the percentage ABV (alcohol by volume) on the container as a measure, '*I don't really look at units but I look at like percentages, just to know how much'.* This was particularly common with *wine 'I look at the percentage. When it's like wine'*. One participant used the percentage to find the strongest alcohol at the cheapest price, and there was agreement for the group for this use of percentage ABV.

3. *Calories in drinks*

Participants (particularly females) mentioned they would often consider and worry about the calories in given drinks, rather than units *'now I think more about like the calorie intake of them'* and *'I went on the unit to calorie converter and put in all the drinks I had and it was like, you consumed 5 burgers worth of calories just by drinking'.* Thus, participants were more inclined to use this measure than units to

reduce drinking as there was an immediate outcome to drinking high amounts *'No, I wouldn't think of it in terms of the units, I would think of it more in terms of how much weight I am going to put on the next day'.*

4. *Conflicting information*

Some participants showed confusion regarding the health risks of alcohol, and put this down to conflicting information they are given. Specific claims that participants had heard and repeated was that certain types of alcohol were better than others to consume *'a lot people say red wine, that's probably the best thing to drink. I don't know what the rumour is about what it does to your health but it calms you down?'* Also, that alcohol could be beneficial during pregnancy *'it's meant to be good for pregnant women, if they drink a glass of red wine'* and for preventing brain degeneration *'stave off Alzheimer's, stave off dementia'.* The view was raised that this information was often used as an excuse to justify drinking levels *'so if someone was to say just drink a bottle of red wine, in fact, it's good for you then I'm doing really well'.*

**Opinions of the Drink Wise glasses**

This section focuses on the opinions of the Drink Wise glasses. The glasses were introduced during the focus group and passed round the group. There were then questions related to general views on the glasses, when they may be useful, who they may appeal to and suggestions for improvements.

This theme is split into seven subthemes: positive views, negative views (which is split into further subthemes: aesthetics, content as 'not serious', and lack of attention), context for use, population that may benefit, unintended use, surprise at measures and suggestions for improvement.

1. *Positive views*

Some participants indicated that the glass would be useful for them. The glasses were generally viewed as a measuring tool that would provide information on drinking which could be beneficial *'it's just interesting to know how much you are actually drinking'.* However, it was emphasised that this was not necessarily to reduce drinking and stick to guidelines, '*I think I would probably try and do drinks a bit*

*more precisely. I don't know if I would drink less, but I think it would be useful'.* Instead it was to raise an awareness of units and give an idea of an individual internal drinking level (the self-defined level that was higher than recommended guidelines) *'I think it would be good to have, like to know how many drinks was normal for you'.*

2. *Negative views*

Aesthetics

A common view from participants was that the glasses were not aesthetically pleasing. An aspect of the glass that was disliked was the Drink Wise logo, as one participant said they may use it were it not for the logo *'maybe if it didn't have Drink Wise on it'.* Some participants emphasised that they would be particularly unhappy consuming certain drinks from the glass as part of the appeal of drinking is the glass that you decide to use, or are given in a bar, particularly for wine *'I wouldn't be content drinking a glass of wine from this'.* This was due to certain glasses being associated with certain drinks, or because the alcohol was consumed from its original container *'I know it's not very classy but I drink out of the wine bottle quite a lot'.*

It was emphasised that the glasses looked like they appealed more to children than adults*, 'like it's some kind of kiddies glass'* or were too educational looking *'it is a bit too educational, that it's off putting. And a bit embarrassingly so'*. Therefore the glasses were not taken seriously *'yer I wouldn't think of it as a serious glass, in a club'* and were even viewed as patronising *'you'd feel a bit patronized'*.

Content as 'not serious'

Many participants did not think the content on the glass (the unit guidelines and health risks) would be taken seriously, one participant stating that in general individuals do not take guidelines and risks seriously *'I'm not sure people take this too seriously anymore'*. It was indicated that this was because the information is already known and had already been communicated in different forms, therefore seeing such information would not lead to behaviour change '*it's nothing we don't know already, and that has been communicated to us by lots of different mediums'*. It was also mentioned that additions to the glass may make the message more salient and potentially more likely to be used, for example if specific health problems and

risks were given. One participant likened the glasses to visual warnings on cigarette packets '*it's just like the same as a cigarette packet but less visually disturbing'.*

Lack of attention

It was suggested the glasses may not be paid attention to due to individuals having a pre-existing motive to get intoxicated; this was particularly highlighted for those on 'nights-out', *'I don't think people would pay a lot of attention. People just go out to drink. I think they'd just do that to be honest'.* A further communication was that even if individuals did initially use the glass to keep track, they would be less likely to do so once under the influence of alcohol due to the feeling of intoxication *'you haven't got a clear head at the best of times, and once you've had a few…'*

3. *Context for use*

Those who thought the glasses may be useful for them highlighted that this would be in the home environment, and that it would not be a useful tool for other drinking environments. Participants said they may find them beneficial at home '*I think it would be quite useful to have one of these in my student house'*, particularly for measuring and transferring '*maybe it's used for doing the measurements and then you can transfer it'* and for pre-drinks '*if you used it like pre-drinking…you might get a bit more value out of it'.*

Participants said they would be less likely to use the glasses if they were given them in pubs or clubs on nights out, '*in a pub, I would pay absolutely no attention to that whatsoever'.* One reason given for this was due to specific aspects of the surroundings, leading to potential difficulty when reading the labels, for example when on a dance floor in close proximity to others and with poor lighting *'when you're like swaying and there's drink in your hands and bad lighting and people like shoving you'.* They also said they would be unlikely to transport them to their drinking environment *'it's not really like transportable, like you wouldn't put it in your bag which already has your make up and your phone in already. Otherwise you would have to leave it wherever you went'.*

4. *Population that may benefit*

A main emphasis was that although many of the participants felt they would not use the Drink Wise glasses to cut down on their own drinking, this was because they did not want to cut down, and that for certain populations the glasses would be beneficial. Many gave indications that they did not want to reduce their drinking '*see I'm not worried about what I drink, so I don't take much notice of it'*. It was highlighted that others may be concerned about their intake for health reasons, and for such individuals these glasses could be a very valuable tool in cutting down '*I think if you wanted to keep track properly, this would be a really good, useful'*. The absence of risk concept in many participants in the current sample was described as being due to age '*I think older people would be more interested, like a lot of students are just like yer lets drink whatever, so I think they'd care more'.* The reason for older individuals caring more was mentioned to be possibly due to existing health problems *'older people are more likely to have illnesses where they need to like limit their drinking'.*

5. *Unintended use*

An issue raised during the focus groups was that the Drink Wise glasses could potentially be used in the wrong way. Participants emphasised that individuals may view the labels as a drinking level that they need to meet each day *'people might think, oh, a small glass of wine, it's only 1.5 units, I haven't had my 12 recommended units this week, I'll have a couple tonight'*. There was the view that students may also use the glasses to exceed their guidelines purposefully, at house parties, in competitions or challenges *'I think people would use it as a challenge…like a club, if you're drunk and everyone's like let's see how much units you can drink'*.

6. *Surprise at measures*

Participants displayed shock at the size of the measurements on the Drink Wise glasses, particularly with the spirit measures *'single shot a lot smaller than I thought it would be'*. Some participants said they would be likely to pour larger measures when drinking *'I think when I make a drink I probably put a lot more than that in'.*

*7. Suggestions for improvement*

Participants gave the impression that they would be more likely to use the glasses if they looked different. Some participants said the glasses would be improved if they were more subtle or simplistic in their design. The glasses were viewed as a measurement tool, not something to be used to drink out of, particularly not if they were given to use in a bar or pub. Suggestions for improvement were to remove the Drink Wise logo *'maybe if it didn't have Drink Wise on it, something a bit subtle, I think people would be more likely to use it*'. It was suggested that glasses with units on may be useful if they were the same shaped glass that was usually used to consume a certain beverage, for example with a unit value next to measurement marks on a wine or pint glass. Some participants thought unit labelling should be standard practice for glasses *'you should always have a marking that tells you the units… like the measurement mark, but it should say in brackets the number of units or...how much is standard'.* Others thought that if unit labels were to be used in bars or clubs then they would have to be more noticeable, for example it was suggested that the labels could be fluorescent or in LEDs.

**5.5 Discussion**

The aim of this study was to use focus groups to investigate the drinking patterns and motives in a population of young adult social drinkers, to examine perceptions and opinions of the Drink Wise glasses and provide an indication of level of support for the use of the glasses to reduce drinking.

Firstly, drinking patterns and motives were investigated. Baseline characteristics indicated that the majority of the sample were risky drinkers, defined by an AUDIT score of 8 or above (Babor et al., 2001). Participants had relatively low readiness to change scores, indicating that most participants did not want to change their behaviour. The focus group findings highlighted that participants varied in their alcohol use, they tended to describe themselves as light drinkers or heavy drinkers, and heavy drinkers concentrated their drinking into one or two days a week. This supports previous research showing two main drinking patterns in students; light drinkers and heavy occasional drinkers, who show moderate to high consumption quantities and frequencies (O'Connor & Colder, 2005), usually concentrating their

alcohol consumption into a few higher intake days (Centers for Disease Control, 2012; Craigs, Bewick, Gill, O'May & Radley, 2012; ONS, 2010).

Drinking was common on social occasions and certain events such as birthdays and end of exam celebrations, and this is supported by research indicating student drinking can increase around specific events (Del Boca et al., 2004). There was variation in drinking patterns, which echoes previous findings of weekly periodicity and fluctuations in consumption behaviour, due to academic requirements and specific campus events and holidays (Hoeppner et al., 2012). The drinking culture of university was emphasised as a factor for an increase in alcohol consumption, and previous research has found that students tend to drink more than non-students of the same age (Dawson, Grant, Stinson & Chau, 2004).

A repeated finding was the pursuit of an internal level of intoxication, which participants did not want to exceed. This supports research on 'controlled intoxication', as it has been found that students who consume alcohol with the intention of getting intoxicated monitor their drinking by using signals to stop or slow down (McEwan, Swain & Campbell, 2011). Young adults have been shown to manage these levels of desired intoxication using specific strategies that combine aspects of perceived risk, information from well-informed and credible sources and discussions (Measham, 2006). They may begin with the intention of getting drunk and accelerate their drinking by drinking before they go out, mixing drinks or consuming drinks they know will make them intoxicated (Engineer, Phillips, Thompson & Nicholls, 2003). However, although over recommended levels this desired intoxication level is bounded in concerns about safety, image and identity and produces a 'controlled loss of control' (Measham & Brain, 2005). Personal guidelines discussed in the focus groups were specific to the individual, not based on existing guidelines or recommendations and were significantly higher than government guidelines, supporting previous findings (Measham & Brain, 2005; Robertson, Aitken & Watkins, 2014). They also varied within participants with factors such as the amount of food consumed beforehand or the drinking occasion affecting the intoxication level.

Participants repeatedly referred to consuming alcohol while pre-drinking. Pre-drinking is common practice among young adults and involves the rapid

consumption of large amounts of alcohol (usually at home) before going to a house party or drinking establishment, where more alcohol is usually consumed (Forsyth, 2010; Wells, Graham & Purcell, 2009). Participants indicated that the Drink Wise glasses could be useful in this kind of drinking situation as a measurement tool when pouring drinks. With pre-drinking linked to an increased risk of alcohol-related harms, such as blackouts (LaBrie, Hummer, Kenney, Lac & Pederson, 2011), this could be a potential avenue for future research to investigate.

In terms of drinking motives, the most common reasons reported for drinking amongst participants were for sociability, to increase pleasure, to reduce anxiety and increase confidence. The extracts from the focus groups are supported by overall average scores for the DMQ-R, as the highest scores were on the social, the enhancement and coping-anxiety subscale respectively. This supports previous research showing consistently higher scores for social motives, followed by coping to reduce negative states and maintaining and enhancing positive affective states (Cooper, 1994). Students mostly drink for social facilitation, and to improve social gatherings (Kuntsche et al., 2005), with those motivated by these factors drinking more frequently (Mobach & Macaskill, 2011). Peer pressure was given as another common drinking motive, supporting research showing heavy drinking is more common in peer groups where it is perceived as normal and encouraged (Ham & Hope, 2003).

The theme investigating current drinking guideline knowledge indicated a good awareness of units and reasonable knowledge of the unit content of drinks and recommended guidelines. However, this information was not typically used to monitor drinking. This was due to the desire for 'controlled intoxication' which requires a much higher amount of alcohol than the guidelines, leading to a perception of the guidelines as unrealistic. This supports research showing units are not often utilised to monitor consumption despite an awareness of the concept (Lader & Steel, 2010) and that younger drinkers can recite alcohol education messages, but fail to connect with knowledge as relevant to their experiences (Seaman & Ikegwuonu, 2010). Female participants were likely to use calories to monitor their drinking. They showed concern over short-term health risks, such as being overweight, which supports research findings that individuals (particularly younger individuals) can have an inability to see long-term risks (Cotter et al., 2013). With no country

requiring nutritional information on packaging (Martin-Moreno et al., 2013), further research into the use of calorie labels is warranted, as this form of information may be more relatable to a young adult population.

The Drink Wise glasses theme demonstrated some support for their potential use. Participants emphasised that they would be useful as a measuring tool to keep track of the amount consumed. This is important as despite a general awareness of units, they are not often used to guide drinking (Gill & O'May, 2007a; Gill & O'May, 2007b), and therefore any efforts that may encourage this are valuable.

There were certain aspects of the Drink Wise glasses that participants thought may discourage individuals from using them. Firstly, participants raised issues with the look of the glass and indicated the importance of the aesthetics of a glass when drinking, in particular the association of different shapes and styles with specific drinks. The glass is a marketing tool, and is used to enhance the drinking experience (Stead et al., 2014). This suggests that having a variety of glasses for different drinks may make tools like this more likely to be used. Secondly, participants indicated that unit guidelines may not be paid attention to or taken seriously, suggesting the message may need to be more salient. For example, similar messages to cigarette package health warnings. Research shows that, unlike cigarette warnings, alcohol warnings have been limited, with single warnings unlikely to catch attention and change behaviour (Stockwell, 2006). It should be noted that the characteristics of the drinkers may explain the negative views of the glasses and resistance to their use. The sample were made up of mostly risky drinkers with low readiness to change scores, therefore it could be that individuals were showing intervention defensiveness, due to the lack of a want to change their behaviour (Leffingwell, Neumann, Leedy & Babitzke, 2007).

Suggestions for improvement of the glasses were also given by the participants. Subtlety was one suggestion, as the glasses were described as looking too 'childlike'. A more simplistic design may encourage the use of the glass for consumption of drinks, rather than just as a measuring tool. However, a subtler design may decrease the likelihood that the information will be noticed, particularly in a pub or club environment. This highlights the difficulty in the design of glassware for reducing

drinking. Such tools would need to maintain a balance of providing information that is noticeable and attended to, but still be desirable to drink from.

A discouraging finding was the potential for the use of the Drink Wise glasses in an unintended way, for example in drinking games and downing competitions. Participating in drinking games has been associated with increased levels of alcohol use and negative alcohol-related consequences (Grossbard, Geisner, Neighbors, Kilmer & Larimer, 2007) and other focus group findings into standard drink labelling have suggested labels could be used to select stronger beverages and increase consumption (Jones & Gregory, 2009). This indicates a potential for the misuse of information which is provided to encourage safer drinking (Kerr & Stockwell, 2012). This is not a reason for not using the glasses, provision of safe guidelines is important, irrespective of the effect on drinking behaviour and it may be employed in those who are actively trying to cut down (Bailey et al., 2011). Furthermore, initial absence of support does not necessarily mean these labels would not be supported as a harm-reduction method if they were employed, as previous research has indicated support tends to increase after labels are implemented (Stockwell, 2006).

A limitation of this study are the significant differences between drinking habits between the current study and Study Three (Chapter Four), with the current sample displaying lower unit consumption, weekly binges and AUDIT scores. It may be that those with heavier drinking patterns have alternative views to those given in these focus groups. However, the sample consisted of majority students and they had an average AUDIT score indicative of risky drinking. Furthermore, it may have been due to the time of year that students were tested, this was emphasised by participants in the focus groups supporting research showing that students have been shown to have fluctuating drinking patterns depending on academic requirements (Hoeppner et al., 2012).

The current sample had relatively low readiness to change ruler scores, similar to scores in Study Three (Chapter Four). This may provide an explanation for participants' indication that the Drink Wise glasses would not be useful for the consumption patterns of students. However, it was highlighted that in other populations (e.g. those who want to cut down) they could be advantageous, particularly for use when measuring and pouring drinks in a home environment.

Drinking at home is on the increase (Foster & Ferguson, 2012) and home drinkers represent a significant health burden (Home Office, 2007). An underestimation of beverage volumes and strengths is most pronounced with consumption away from licensed premises (Boniface et al., 2013), therefore the glasses could be a useful tool for those who try to drink within recommended guidelines but overestimate their pours. Future research should investigate the glasses with different populations, and in those who are trying to cut down and assess their use in a home environment as well as a bar context.

To conclude, the current population showed drinking patterns and motives consistent with previous research into student drinking. The main aims of the study were to investigate social drinkers' opinions surrounding the Drink Wise glass and its ability to reduce alcohol-related harm, and to explore the results of Study Three (Chapter Four). Some participants showed support for the glasses and thought they could be useful, particularly when drinking at home (e.g. when pre-drinking). However, most participants indicated they would be reluctant to use the glasses, supporting Study Three findings. One reason given for this was difficulty with recommended unit information. Health policies assume individuals want to drink responsibly, however young social drinkers appear to manage their intoxication in terms of a desired state, which for many requires drinking above government recommendations. Participants did indicate that alternative information could be beneficial as a harm-reduction method, specifically calorie information. Additionally, participant feedback from the current study can inform future glass label design; participants highlighted that information should be presented in a more simplistic form and on glasses that individuals are used to drinking from.

# Chapter Six (Study Five and Study Six)

## The effect of glass labels with calories, units and exercise or food equivalents on alcohol consumption and intention to drink

## 6.1 Abstract

One method to reduce excessive drinking in the UK is alcohol labelling, but there is little research supporting the effectiveness of current labelling on consumption. This may be due to the inability of individuals to relate to unit information. Although mandatory on food products, currently no country in the world requires nutritional information or calories on alcohol packaging. Two studies were conducted to investigate whether, compared to no information and unit and calorie information alone, glass labels containing calories with food or exercise equivalents can change drinking behaviour. The first (Study Five) investigated whether the labelled glasses reduced consumption of beer during a forty-five minute ad libitum drink period. One-hundred social drinkers attended a single experimental session in a semi-naturalistic bar-laboratory setting. A battery of questionnaires measured drinking habits, alcohol-related problems, readiness to change, dietary and exercise behaviours and alcohol urge. Participants were randomized to drink beer from a pint glass with one of four labels: unit and calorie label, unit and calorie with exercise equivalent label, unit and calorie with food equivalent label, no label (control). The total amount of alcohol consumed was measured (max available alcohol = 2 pints, 5.6 units). The second study (Study Six) was an online study to investigate the effect of engagement with the labels on intention to drink. One hundred and forty two participants provided measures of drinking habits and readiness to change. Participants interacted with the labels on a variety of alcoholic drinks before a recall task. The number of drinks participants were intending to consume and likelihood of drunkenness in the next week were measured. There was a marginally significant reduction in alcohol consumption in Study Five with exercise equivalent labels compared to calorie and unit information in females, but there were no other significant effects of the glass labels on alcohol consumption or intention to drink in Studies Five and Six. It is concluded that calorie labels with food or exercise equivalents do not appear to influence drinking behaviour in a young adult population. This may be due to characteristics of the population, suggesting that alcohol harm-reduction strategies need to use alternative strategies, especially in naturalistic drinking environments, to achieve behaviour change.

## 6.2 Introduction

The reflective-impulsive model of behaviour drinking behaviour is framed as a conflict between the impulsive and reflective systems (Strack & Deutsch, 2004). The impulsive system often overrides the reflective system's attempts to shape behaviour using expectancies and values attributed to a behaviour. This is particularly likely in an environment containing alcohol cues, which possess strong incentive value (Hofmann et al., 2008). One current method to reduce excessive drinking in the UK is alcohol labelling; alcohol packaging currently contains government health warning labels giving details of alcohol unit content and safe daily guidelines for men and women (Wilkinson & Room, 2009). Labelling has been described as a choice architecture intervention, as it alters the properties of an object in an environment (Hollands et al., 2013). Choice architecture interventions have been suggested to be more effective than traditional interventions as they deliberately shape the immediate environment to target the impulsive system, rather than the reflective system, and produce behaviour change (Thaler & Sunstein, 2008).

Results from Study Three support findings of ineffectiveness with current alcohol labels (Knai et al., 2015; Wilkinson et al., 2009). In a young adult population a Drink Wise glass, which included unit and guideline labels, did not reduce alcohol consumption compared to a plain glass. Previous evidence indicates that although unit and guideline labels can have beneficial effects in terms of impacting recognition of the message, increasing awareness and encouraging discussion this does not translate to drinking behaviour (Wilkinson et al., 2009, Scholes-Balog, Heerde & Hemphill, 2012). In Study Three this was suggested to be due to poor knowledge of the unit concept. Studies indicate that although individuals are aware of the concept of units, only a small amount keep check on the amount of units they consume (Lader & Steel, 2010; Gill & O'May, 2007a; Gill & O'May, 2007b), there is an overestimation of how many units constitute a binge (Cooke et al., 2010) and knowledge of correct guidelines and health risks is lowest in those who drink above the guidelines (Cotter et al., 2013). This shows alcohol labels in their current form are not effective, it may be that individuals are not aware of the significance of drinking above unit guidelines in terms of translation to actual health risks. In addition, drinkers often fail to acknowledge the long-term impact of health risks, suggested to be due to either a knowledge deficit or self-exempting beliefs (Cotter et

al., 2013). Self-exempting beliefs occur when there is an inconsistency between beliefs and a behaviour (Chapman, Wong & Smith, 1993), e.g. continued drinking, despite the knowledge that drinking is harmful, may result in denying that knowledge.

To gain an insight into Study Three findings, focus groups were conducted (see Study Four). Results indicated a reasonable knowledge of unit guidelines, yet it was highlighted that these were not often utilised to monitor drinking. Unit guidelines were not considered to be taken seriously and female participants highlighted they were more likely to use calorie information to monitor their drinking than units. This suggests that heavy drinking in this population may not be due to a lack of knowledge of unit guidelines. Instead, in a young heavy drinking population, short-term risks associated with intoxication, such as weight gain, may be more relevant than long-term risks associated with consumption. Provision of information that this population place more significance on (e.g. nutritional information) might be more beneficial, especially for those who are conscious of body image and who may ignore less visible consequences (Isted, Fiorini & Tillmann, 2015a).

Alcohol has an energy value of 7.1 kcal/g (Lieber, 2000), second only to fat, which is the most energy dense macronutrient (Martin-Moreno et al., 2013). One unit of alcohol contains eight grams which provides 56 calories (RSPH, 2014) and in those who drink it has been shown to account for 8.8% of total energy intake in a sample aged 19-64 years (Bates, Lennox, Bates & Swan, 2009). Furthermore many alcoholic drinks will also contain high amounts of sugar (RSPH, 2014). Thus it is peculiar that nutritional information and calorie labels are not readily available or required on alcohol products in any country (Martin-Moreno et al., 2013). Excessive drinking has been highlighted as a causal factor in obesity (Sayon-Orea, Martinez-Gonzalez & Bes-Rastrollo, 2011). Heavy drinkers are at a higher risk of obesity than moderate drinkers (Wannamethee & Shaper, 2003) and evidence suggests binge drinkers have higher odds of being overweight or obese than those who consume lower quantities of alcohol over multiple sessions (Arif & Rohrer, 2005). Excess body weight and alcohol consumption lead to increased health risks, for example increased incidence of liver cirrhosis (Liu, Balkwill, Reeves & Beral, 2010).

As well as the excess calories from alcohol, the increase of high-calorie food intake following alcohol consumption is also a contributing factor (Yeomans, 2010). A recent study found that a priming dose of alcohol increases calorie intake from food compared to placebo (Christiansen, Rose, Randall-Smith & Hardman, 2016a). It has been shown that this increase in appetite after drinking is more likely in moderate risk drinkers than low risk drinkers, and that these drinkers are also more likely to make less healthy food choices (Lloyd-Richardson, Lucero, DiBello, Jacobson & Wing, 2009).

The link between alcohol and obesity is particularly relevant for students, as university is a period that has been identified as high risk for weight gain (de Vos et al., 2015). Students in their first year gain significantly more weight than individuals of the same age who do not attend university (Anderson, Shapiro & Lundgren, 2003b). This is suggested to be due to an increase in heavy drinking, irregular eating patterns and a decrease in physical exercise (de Vos et al., 2015). There is a knowledge deficit regarding calories in alcohol, in a sample of 282 US college students, 65.7% were unaware of the calorie content of typically consumed alcoholic drinks (Lloyd-Richardson et al., 2009). In a recent survey, 80% of individuals did not know or underestimated the amount of calories in a large glass of wine and 60% in a pint (RSPH, 2014). Individuals often do not account for these calories in their daily intake (Alcohol Concern, 2010). To improve this knowledge, there has been a call for calorie labels to be included on drinks, with a suggestion that calorie information should be available before any alcohol beverage purchase (RSPH, 2014). Public support for the inclusion of this information is high; 67% support the provision of calorie labelling (RSPH, 2014).

Current research into calorie labelling and food can give an insight into their potential effectiveness with alcohol. The evidence concerning the inclusion of only calories on food menus is inconsistent; some show a reduction in energy ordered and others show no change (Cioffi, Levitsky, Pacanowski & Bertz, 2015; James, Adams-Huet & Shah, 2015). There is good evidence that consumers are aware of calorie content and nutritional information regarding food, however only a small minority indicate this influencing their choice (Dumanovsky, Huang, Bassett & Silver, 2010). This echoes findings with alcohol and unit content awareness, where knowledge of the number of units in drinks does not necessarily mean individuals keep check of

the number of units they consume (Lader & Steel, 2010; Gill & O'May, 2007a; Gill & O'May, 2007b). This lack of effectiveness may indicate that individuals have difficulties in interpreting calories. It has been claimed that information on nutrition-labels is provided in a manner that does not make sense to consumers (Macmaoléin, 2015), as it requires both nutrition knowledge and mathematical processing (James et al., 2015).

Expressing calorie information in an alternative form may be more effective (RSPH, 2016). Research into the effect of exercise equivalent (e.g. minutes running or walking) with food choice has recently been investigated. It has been found that physical activity information results in a reduction in purchases of sugary drinks compared to energy and percentage of total intake labels (Bleich, Herring, Flagg & Gary-Webb, 2012). On menu labels, calories and exercise equivalents are more effective than calorie labels alone on improving fast food choice (Dowray, Swartz, Braxton & Viera, 2013; Platkin et al., 2014). In terms of consumption of food, exercise labels have been shown to lead to significantly less energy intake compared to a no labels group (James et al., 2015). Alcohol is often a complement to sedentary activities such as watching television and attending sporting events, which may promote further weight gain (National Obesity Observatory [NOO], 2012). Therefore, this type of information is particularly useful as it reminds individuals of the importance of being active (RSPH, 2016). Research into exercise and alcohol consumption is mixed, some students have been shown to demonstrate a need to engage in obligatory exercise (excessive repetitive exercise) (Pasman & Thompson, 1988). Some evidence shows that excessive exercise behaviours are positively related to drinking (Moore & Werch, 2008), while other findings show a curvilinear relationship, with exercise associated with moderate drinking (Lisha, Sussman & Leventhal, 2013), and other research in students finds that drinking is inversely related to physical activity (Correia, Carey, Simons & Borsari, 2003). Half of students claim they wish to change sedentary behaviour (Keating, Guan, Pinero & Bridges, 2005), therefore for those that are active or wish to be more active, this information may be particularly beneficial.

Another method that may be effective, especially for sedentary individuals, is including food equivalents on alcohol drink labels. The UK population has poor knowledge of alcohol calories and their food equivalents (RSPH, 2014), with a

recent survey demonstrating that although most participants believed alcohol was fattening, fewer than half thought a pint of beer contained more calories than a can of coke (Isted et al., 2015a). There is currently no research to date investigating the effect on drinking behaviour of food and exercise equivalent labels on alcoholic beverages. Drinking campaign and charity websites often contain drink calculators giving this information (e.g. Drinkaware Unit & Calorie Calculator), therefore it is useful to investigate whether provision of this information can be beneficial in a controlled experiment.

The current study will determine whether, compared to no information and unit and calorie information alone, glass labels containing calories and units with food or exercise equivalents reduce alcohol consumption in a semi-naturalistic bar-laboratory. Glass labels were used as current alcohol labelling is given on the side of beverage containers, yet often drinking will occur without the consumer handling these. Providing the information on the side of the glass ensures it is seen at the moment of consumption, perhaps increasing the likeliness it may change behaviour in the drinking environment. It was hypothesised that unit and calorie labels would lead to reduced ad libitum alcohol consumption compared to a plain glass, and that the addition of exercise and food equivalent information would lead to reduced ad libitum alcohol consumption, compared to unit and calorie information alone.

To further investigate our hypothesis, we also conducted a second, online study. This was to investigate the effect of engagement with these labels on different types of alcoholic beverages, and their effect on behavioural intentions. Behavioural intentions are instructions that individuals give themselves to behave in a certain way (Sheeran, 2002). It is widely acknowledged that asking individuals how they intend to behave is the best way to know how they will behave (Sheeran, 2002). A recent meta-analysis indicates that in terms of alcohol consumption, intention has a strong correlation with behaviour (Cooke et al., 2016). It was hypothesised that unit and calorie information would lead to decreased intention to drink compared to volume information, and that the addition of either exercise and food equivalent information would lead to decreased intention to drink scores, compared to unit and calorie information alone.

Study Five

### 6.3.1 Method

Participants

One-hundred participants (52 female; mean age 22.4, SD ±4.93) were recruited from the University of Liverpool via advertisements, word of mouth and using the university's online EPR system. Inclusion criteria were fluency in English and weekly consumption of alcohol (mean weekly unit consumption: 25.79 [SD ±15.64], UK alcohol unit = 25ml of a standard spirit = 8 grams of pure alcohol). All participants provided informed consent before taking part in the study and received £5 reimbursement as compensation for their time. The study was approved by the University of Liverpool Research Ethics Committee.

Power calculation

Power calculations using GPower (Faul & Erdfelder, 1992) indicated that a sample size of 100 would detect between a medium (cohen's f = 0.25) and large effect (cohen's f = 0.4), with power (1—β) set at 0.80 and α = 05.

Design

The study was a between subject design. Participants were randomly assigned (stratified by gender) to one of four glass label conditions; control (plain glass with no labels), calorie and unit label, calorie and unit label with exercise equivalent and calorie and unit label with food equivalent.

Questionnaire Measures

*Alcohol Use Disorders Identification Test (AUDIT, see Appendix 1 and page 32 for full description)* (Saunders et al., 1993). The AUDIT is a clinical screening tool designed to pick up the early signs of hazardous drinking (Babor et al., 2001).

*Timeline Follow Back Questionnaire (TLFB, see Appendix 2 and page 33 for a full description)* (Sobell & Sobell, 1992). The TLFB is a self-report measure which estimates weekly alcohol consumption in UK units and binge frequency (binge defined as: ≥8 units p/drinking episode in men, ≥6 units p/drinking episode in women [NICE, 2010]).

*Readiness to change contemplation ruler (RTC ruler, see Appendix 3 and page 34 for a full description)* (LaBrie et al., 2005). The contemplation ruler is a single item continuum measuring from 0-10 with 0 representing the statement 'I never think about my drinking' and 10 representing the statement 'My drinking has changed. I now drink less than before'.

*The Dutch Eating Behaviour Questionnaire (DEBQ, see Appendix 16*) (Van Strien et al., 1986). The DEBQ contains 33 items with 3 subscales assessing restrained, emotional and external eating behaviour. Items are scored across a 5 point Likert scale with responses ranging from 'Never' to 'Very Often'. The subscales have high internal consistency and factorial validity (Van Strien et al., 1986). This measure was developed to investigate eating behaviour, and research shows that it is the restraint factor of the DEBQ which is most often associated with drinking (Caton, Nolan & Hetherington, 2015). Therefore, only the restraint factor was analysed.

*The Obligatory Exercise Questionnaire (OEQ, see Appendix 17*). (Pasman & Thompson, 1988). The OEQ is a 20 item self-report questionnaire (modified from the Obligatory Running Questionnaire [Blumenthal, O'Toole & Chang, 1984]) that assesses an individual's obligation to and compulsion for exercise. Obligatory exercise has been defined as a need to engage in repetitive exercise behaviours and experiencing negative emotions associated with missing exercise sessions (Pasman & Thompson, 1988). Items are scored across a four-point scale with responses ranging from 'never' to 'always'. Higher scores indicate more obligatory exercise behaviours. The scale has good internal consistency ($\alpha$=0.96) and good test-retest reliability (Pasman & Thompson, 1988). It has also been used in student aged samples (Ackard, Brehm & Steffen, 2002).

Materials

*Labelled glasses (see Figures 6.1-6.3)*. The glasses were pint glasses with labels containing accurate unit and calorie and food and exercise equivalent information for the beverage that was provided (Heineken, 5%ABV). The information was obtained from the unit and calorie calculator tool on the Drinkaware website (https://www.drinkaware.co.uk/understand-your-drinking/unit-calculator).

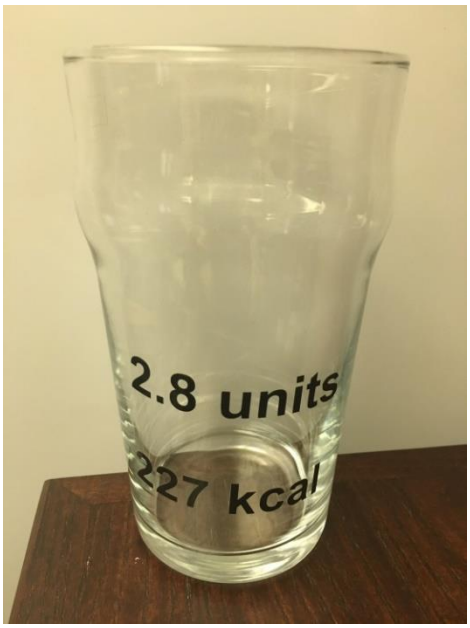



*Figure 6.1. Unit and calorie labelled glass*


*Figure 6.2. Unit and calorie labelled glass with running equivalent*


*Figure 6.3. Unit and calorie labelled glass with food equivalent*

Outcome Measures

*Alcohol Urge Questionnaire (AUQ, see Appendix 9 and page 57 for a full description)* (Bohn et al., 1995). This is an eight-item state measure that assesses the urge for an alcoholic drink at the time the questionnaire is completed, and is therefore a measure of acute craving. Items are scored across a 7 point Likert Scale from 'strongly disagree' to strongly agree'.

*Alcohol consumption & Taste test* (*see Appendix 12)* (Jones et al., 2013). Participants were provided with 568ml of beer and the main outcome measure was amount consumed (units). They were given the option of ordering up to one more pint (maximum consumption = 2 pints, 5.6 units, ~0.66g/kg based on a 70kg person). To provide a plausible reason for consuming alcohol participants were asked to complete a taste rating assessment of the drinks consisting of a 10 point Likert scale of the following attributes: 'fruity', 'smooth', 'sweet', 'refreshing', 'bitter', 'strong tasting', 'gassy', 'pleasant', 'light', 'tasty'. Taste ratings were not analysed

*Unit and nutritional knowledge questionnaire (see Appendix 18*). Participants were asked six questions regarding units and nutritional information in relation to common drinks. They were asked these questions before and after the drinking period and informed that there may be information on the side of their glass to help answer the questions at time 2. This was to encourage engagement with the labels. '1. How

many units of alcohol are in a standard glass of wine (12% ABV, 175ml)? 2. How many units of alcohol are in a standard pint of beer (5% ABV, 568ml)? 3. How many units of alcohol are in a standard shot of vodka (37.5% ABV, 25ml)? 4. Are there more calories in a can of coke (330ml) or a standard glass of wine (12% ABV, 175ml)? 5. Are there more calories in a McDonald's Big Mac or 3 standard pints of beer (5% ABV, 568ml)? 6. How many minutes of jogging would you need to burn off the calories from a standard glass of wine (12% ABV, 175ml)?'

*Qualitative questions (see Appendix 19).* Participants were asked questions on their awareness of the aims of the study and the success of the cover up story. They were then asked qualitative questions to obtain an insight into individual views on the glasses (e.g. 'what were your views on the glasses you were drinking from?' and 'did you think they may have affected your drinking behaviour?') These were coded for analysis to examine differences between conditions.

**Procedure**

Testing took place in a semi-naturalistic bar-laboratory. All participants were required to provide a zero breath alcohol reading prior to the study session. Participants gave informed consent, completed the battery of questionnaire measures (AUDIT, TLFB, RTC, OEQ, DEBQ, baseline AUQ) and the alcohol knowledge questionnaire before the main experimental task. They were informed that they would complete the alcohol knowledge questionnaire for a second time, and that there may be information on the side of the glass to help them answer these questions. This was to ensure engagement with the labels. Participants were provided with a pint of beer (1 pint [568.26ml] of Heineken, 5%, 2.8 units, ~0.33g/kg based on a 70kg person). Beer was chosen as it is a drink that is consumed regularly and it ensured that participants could consume a reasonably high volume of alcohol without consuming a high number of units. The study was disguised as an 'alcohol and comedy perception study' and participants were informed they were being filmed to measure their humour reactions to a comedy show (QI- Series M, Episode 1, length 44 minutes). They were informed that they could drink as much or as little of the beverage as they wanted and that they could order another drink if they finished the first beverage (maximum consumption = 2 pints, 5.6 units, ~0.66g/kg based on a 70kg person). The researcher left the lab to ensure participants felt comfortable in the

drinking environment and returned to pour another beverage if it was requested. After a 45 minute experimental period participants were required to fill out a second battery of questionnaires (AUQ T2, taste test, alcohol knowledge questionnaire, awareness questions, qualitative questions, height, weight). Participants were then breathalysed again, before being debriefed and compensated for their time. If participants' breath alcohol concentration scores were over 0.17mg/l (half the U.K. legal driving limit), they were advised to stay in the laboratory or signed a waiver to confirm they were aware of their level of intoxication. Left over drinks were measured to calculate the amount of alcohol consumed by each participant.

### 6.4.1 Results

All variables were log transformed before analysis to correct skewness.

Participant Characteristics

Descriptive statistics are presented in Table 6.1. MANOVA indicated there were no significant differences between groups, except with regards to the OEQ, which was significantly higher in the control condition, [F (3, 99) = 3.56, p = 0.02]. Post-hoc t-tests indicated the significant differences were between the exercise equivalent and control condition (p=0.02) and the food equivalent and control condition (p = 0.02). Average response on the OEQ overall was 41.13 (SD ±8.10), a score which compares to other student samples (e.g. M = 41.68 in Chalk, Miller, Roach & Schultheis, 2013). Groups did not statistically differ on any other factors. The sample was made up of 79% risky drinkers, identified by an AUDIT score of 8 or above (Babor et al., 2001). Groups did not statistically differ in percentage of risky drinkers, [$\chi^2$ (3, $N$ = 100) =0.18, p=0.98]. The mean score on the readiness to change ruler was 2.05 (SD ±2.15), indicating low readiness to change, an answer which lies between 'I never think about my drinking' and 'sometimes I think about drinking less'. Mean score on the restrained eating subscale was 2.42 (SD ±0.77), a score which lies between 'never' and 'seldom', suggesting low restraint overall.

Of the 100 participants, 6 guessed the aim of the study and 7 indicated they more or less understood the aims (e.g. that we were looking at knowledge of units and calories and the effect on drinking behaviour). When conducting the analysis with

and without these participants, findings did not differ, so we included them in the final sample.

**Table 6.1: Means (±SD) for participant characteristics by condition (N=100)**

| | *Mean scores(±SD)* | | | | | *Statistics (MANOVA)* | |
|---|---|---|---|---|---|---|---|
| Variable | *Control (25) Female (15) Male (10)* | *Calories and units (25) Female (12) Male (13)* | *Exercise equivalent (25) Female (11) Male (14)* | *Food equivalent (25) Female (14) Male (11)* | *Overall (100) Female (52) Male (48)* | *F* | *p* |
| Age (y) | 22.32 (4.32) | 23.08 (5.72) | 22.08 (5.55) | 22.14 (4.17) | 22.40 (4.93) | 0.21 | 0.89 |
| BMI ($kg/m^2$) | 22.99 (1.89) | 24.48 (3.85) | 24.03 (5.68) | 23.93 (2.97) | 23.86 (3.84) | 0.68 | 0.56 |
| AUDIT (0-40) | 13.32 (5.96) | 13.00 (7.41) | 11.72 (5.83) | 12.24 (5.93) | 12.57 (6.25) | 0.32 | 0.81 |
| Weekly consumption (TLFB) (units) | 27.26 (14.99) | 25.26 (18.49) | 24.24 (12.17) | 26.38 (17.00) | 25.79 (15.64) | 0.18 | 0.91 |
| Weekly binge (units) | 2.5 (1.29) | 2.28 (1.28) | 2.36 (0.94) | 2.58 (1.29) | 2.43 (1.25) | 0.38 | 0.77 |
| RTC ruler (0-10) | 1.48 (1.53) | 2.64 (2.78) | 1.84 (1.60) | 2.24 (2.37) | 2.05 (2.15) | 1.32 | 0.27 |
| OEQ score (20-80) | 45.68 (8.64) | 40.56 (8.26) | 39.08 (7.25) | 39.2 (6.70) | 41.13 (8.10) | **3.56** | **0.02*** |
| DEBQ restrained (1-5) | 2.62 (0.83) | 2.28 (0.51) | 2.36 (0.84) | 2.41 (0.86) | 2.42 (0.77) | 0.62 | 0.61 |

p < .05, *p < .01, **p <.001***

BMI = Body Mass Index; AUDIT = Alcohol Use Disorders Identification Test; TLFB = Time Line Follow Back; Weekly binge = number of binge drinking episodes per week; RTC ruler: Readiness to Change Ruler; DEBQ = Dutch Eating Behaviour Questionnaire; OEQ = Obligatory Exercise Questionnaire

## Primary analysis

A one-way ANOVA was conducted to examine the effect of glass labels (condition: control, calorie and units, exercise equivalent, food equivalent) on alcohol consumed (mls) and change in alcohol urge. Due to the significant baseline differences in OEQ scores, we added the variable into the ANOVAs as a covariate

*Alcohol consumption (see table 6.2 for consumption by condition)*

There were no significant differences between conditions in the amount of alcohol consumed, [F (3, 99) = 1.38, p = 0.25].

**Table 6.2. Consumption of beer (mls), by condition (see figure 6.4 for consumption by gender)**

| *Condition* | *Mean* | ± *SD* |
|---|---|---|
| Control | 630.36 | 327.19 |
| Calories and units | 766.68 | 316.79 |
| Exercise equivalent | 609.56 | 362.65 |
| Food equivalent | 607.36 | 294.99 |
| Overall | 653.49 | 328.10 |

*Alcohol urge*

A repeated measures ANOVA investigated the difference in AUQ between time 1 and time 2. There was a significant main effect of time, with urge increasing in all conditions over time, [F (1, 96) = 7.24, p = 0.008, $\eta p^2 = 0.0$]. An AUQ change score was calculated. There were no significant differences between conditions in AUQ change score, [F (3, 99) = 0.053, p = 0.98].

Therefore, there were no effects of the labelled glasses on alcohol consumption or urge scores.

Correlational analysis

Correlational analysis assessed the relationship between alcohol consumption and drinking and dietary characteristics scores within each condition (see table 6.3) and overall. A p-value of 0.01 was used to correct for multiple comparisons.

Overall, there a significant negative correlation between consumption and DEBQ restraint ($r = -0.4$, $p < 0.01$).

There were no significant correlations with alcohol consumption and drinking and dietary characteristics, by condition.

**Table 6.3: Pearson's correlations (N = 100) between alcohol consumed (mls) and drinking and dietary characteristics**

| | Alcohol consumed (mls) | | | | |
|---|---|---|---|---|---|
| | Condition | | | | |
| *Drinking characteristics* | Control | Units and calories | Exercise equivalent | Food equivalent | Overall |
| Weekly units | 0.35 | 0.31 | 0.20 | 0.08 | 0.20 |
| Weekly binge (units) | 0.33 | 0.40 | 0.38 | -0.16 | 0.20 |
| AUDIT | 0.19 | 0.29 | 0.22 | 0.09 | 0.19 |
| RTC ruler | -0.24 | -0.16 | 0.09 | 0.10 | 0.08 |
| AUQ change | -0.34 | -0.28 | -0.21 | -0.25 | -0.18 |
| OEQ | -0.03 | 0.07 | -0.21 | 0.19 | -0.01 |
| DEBQ restrained | -0.45 | -0.12 | -0.34 | -0.41 | **-0.40**** |

p < .05, *p < .01, **p <.001***

Unit and nutritional information knowledge

Overall, participants answered 41% of questions regarding units and nutritional information in beverages correctly at time 1. A 2 (time: T1/T2) x 4 (condition: control/units and calories/exercise equivalent/food equivalent) mixed-design ANOVA was used to investigate changes in alcohol knowledge. There was a main effect of time, [F (1, 96) = 7.09, p = 0.01], participants answered significantly more questions correctly at time 2 (M = 2.46, SD ±1.2) than time 1 (M = 2.83, SD ±1.27). There was no significant main effect of condition (p = 0.48) or condition x time interaction (p = 0.79).

Exploratory post-hoc analysis

A 2 x 4 ANOVA was conducted to investigate the effect of gender (male, female) and the glass labels (condition: control, calorie and units, exercise equivalent, food

equivalent) on alcohol consumed (mls) and AUQ change. Due to the significant baseline differences in OEQ scores, we added the variable into the ANOVA as a covariate.

There was a main effect of gender on alcohol consumed [$F (1, 99) = 1.47$, $p = 0.001$, $\eta p^2 = 0.19$], with males ($M = 796.35$, $SD\pm 290.8$) consuming more than females ($M = 521.62$, $SD\pm 306.75$). The condition x gender interaction was approaching significance, ($F (3, 99) = 2.54$, $p = 0.06$, $\eta p^2 = 0.08$). Post-hoc t-tests indicated the significant differences were in the female group between the calorie and unit condition and exercise equivalent condition ($p = 0.02$), with consumption significantly lower in the exercise equivalent label condition (see figure 6.4).

For AUQ change score the main effect of gender and the condition x gender interaction were non-significant ($ps > 0.8$).

Therefore, exercise equivalent labels led to reduced consumption compared to unit and calorie labels in females.

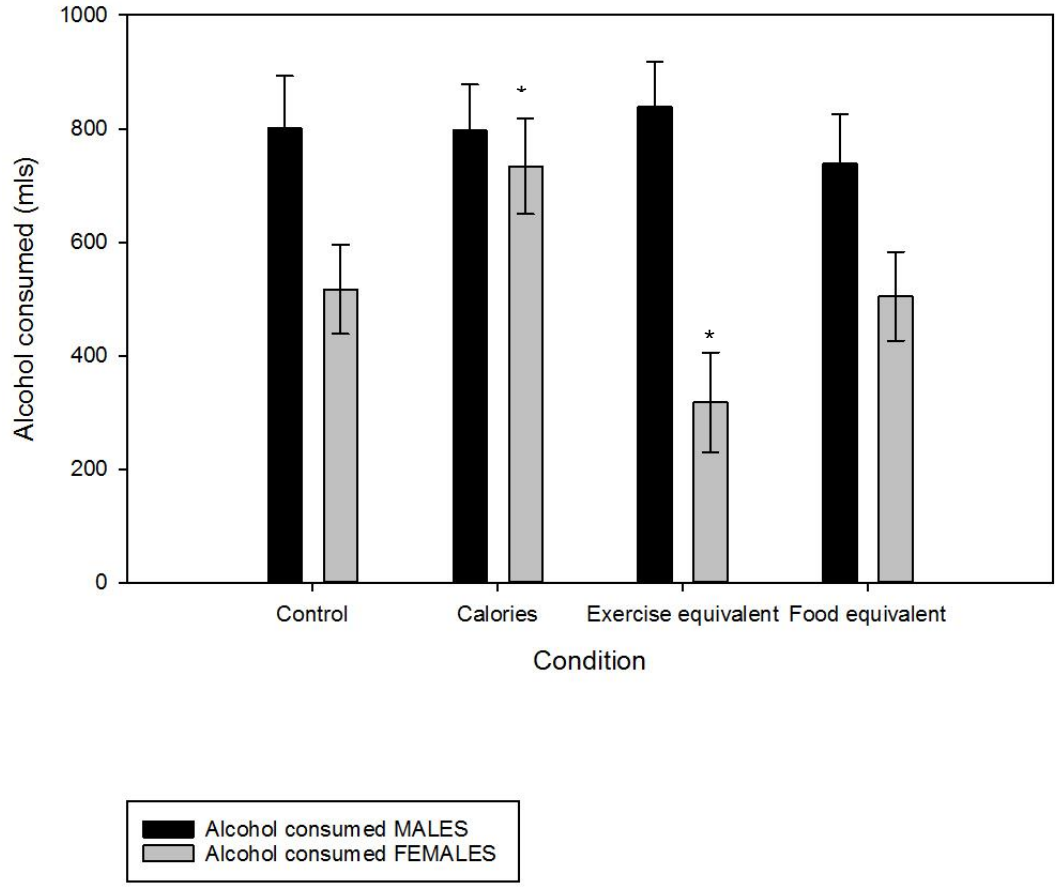



*Figure 6.4. Alcohol consumed, by condition and gender. Error bars represent SE of the mean. *significant difference between label conditions, p<0.05.*

Views on the labels

Participants were asked qualitative questions to provide an insight into their views on the labels. Views on the labels were coded into positive, negative and neutral. Participants were also asked whether they believed the labels influenced alcohol consumption.

Views on the labels were largely neutral (91%). Most participants (46%) believed the labels would not influence consumption, compared to 22% that did. The rest were unsure or did not mention this in their response. These responses did not differ between conditions [$\chi^2$ (6, $N$ = 72) =8.33, p = 0.22]. A minority (17%) of participants indicated

that although they did not believe the labels influenced their consumption, they did increase awareness.

Cover-up story

Overall, 6% of participants guessed the aims, and 7% nearly guessed the aims. Although the rest of participants did not manage to guess the aims of the study, the majority (83%) answered 'yes' when asked if alcohol consumption was being measured. When asked what the purpose of the video camera was, 41% believed it was to measure alcohol consumption and 44% believed it was to measure reaction to the comedy show. This did not differ between groups [$\chi^2$ (12, N = 100) = 5.99, p = 0.92].

**Study Six**

### 6.3.2 Method

Sample

One-hundred and forty-two participants (107 female; 23.79 years [SD ±4.27]) were recruited from the University of Liverpool via advertisements, word of mouth and using the university's online EPR system. Inclusion criteria were fluency in English and weekly consumption of alcohol, (UK alcohol unit = 25ml of a standard spirit = 8 grams of pure alcohol). All participants provided informed consent before taking part in the study and received £5 reimbursement as compensation for their time. The study was approved by the University of Liverpool Research Ethics Committee.

Glass stimuli (see Figures 6.5-6.8).

Glass stimuli were developed via a google image search of common drinks (glass of wine, pint of beer, gin and tonic, double rum and coke, jagerbomb), text boxes with nutritional information labels (units and calories, units and calories with exercise equivalent, units and calories with food equivalent) and volume information (control group) were placed on the images.


*Figure 6.5. Volume labelled glasses (control)*


*Figure 6.6. Unit and calorie labelled glasses*


*Figure 6.7. Unit and calorie labelled glass with running equivalent*


*Figure 6.8. Unit and calorie labelled glass with food equivalent*

Power calculation

Power calculations using GPower (Faul & Erdfelder, 1992) indicated that a sample size of 140 would detect between a medium (cohen's f = 0.25) and large effect (cohen's f = 0.4), with power (1—β) set at 0.80 and α = 05.

Design

The study was a between subject design. Participants were randomly assigned to one of four glass label conditions; control (volume information), calorie and unit label, calorie and unit label with exercise equivalent and calorie and unit label with food equivalent.

Questionnaire Measures

*Alcohol Use Disorders Identification Test (AUDIT, see Appendix 1 and page 32 for full description)* (Saunders et al., 1993). The AUDIT is a clinical screening tool designed to pick up the early signs of hazardous drinking (Babor et al., 2001).

*Readiness to change contemplation ruler (RTC ruler, see Appendix 3 and page 34 for a full description)* (LaBrie et al., 2005). The contemplation ruler is a single item continuum measuring from 0-10 with 0 representing the statement 'I never think about my drinking' and 10 representing the statement 'My drinking has changed. I now drink less than before'.

Outcome measures

*Intention to drink.* Behavioural intentions are instructions that individuals give themselves to behave in a certain way (Sheeran, 2002). Intention to drink was measured by asking participants how many alcoholic drinks they were planning to consume in the next week and how likely it was that they will get drunk in the next week on a scale from 0-9, with 0 being 'not likely' and 9 being 'very likely'.

Procedure

The study was disguised as investigating 'knowledge of alcohol information'. Participants interested in taking part in the study were directed to a secure website. After reading the information sheet and providing informed consent they completed baseline drinking characteristics (AUDIT, RTC ruler). They were then randomized to

one of four conditions (volume of drink [control]; calories and unit information; calorie and unit information with exercise equivalent; calorie and unit information with food equivalent) and required to interact with this information, in the form of labels on photos of common alcoholic drinks. Participants were informed to direct their attention to the specific information depending on condition and to maximise engagement they were informed that they were required to recall the specific information in a later task. After interacting with the information participants completed the recall task in which they were required to remember specific information related to certain drinks, by choosing the correct answer from three possible options. Intention to drink was measured after the recall task and participants were debriefed. The entire experiment lasted no longer than 10 minutes

### 6.4.2 Results

All variables were log transformed before analysis to correct skewness.

Participant characteristics

Descriptive statistics are presented in table 6.4. MANOVA indicated groups did not statistically differ on any of these factors. The sample was made up of 42% risky drinkers, identified by an AUDIT score of 8 or above (Babor et al., 2001). Groups did not statistically differ in percentage of risky drinkers [$\chi^2$ (3, $N$ = 141) =2.34 p=0.5]. Average score on the RTC was 2.52, indicating relatively low readiness to change, an answer which lies between 'I never think about my drinking' and 'sometimes I think about drinking less'

Of the participants, 9 guessed the aim of the study and 7 indicated they more or less understood the aims (e.g. that we were investigating the effect of alcohol-related information on drinking behaviour). When conducting the analysis with and without these participants, findings did not differ, so we included them in the final sample.

**Table 6.4. Means (±SD) for participant characteristics by condition (N=142)**

| Variable | *Mean scores(±SD)* *Control (37)* | *Calories and units (35)* | *Exercise equivalent (36)* | *Food equivalent (33)* | *Overall (142)* | *Statistics (MANOVA)* *F* | *p* |
|---|---|---|---|---|---|---|---|
| Age (y) | 23.14 (3.99) | 23.94 (4.61) | 24.64 (4.34) | 23.55 (4.19) | 23.79 (4.27) | 0.82 | 0.49 |
| AUDIT (0-40) | 10.68 (4.56) | 9.43 (5.24) | 8.06 (4.41) | 9.88 (6.04) | 9.66 (5.40) | 2.17 | 0.09 |
| RTC (0-10) | 2.46 (2.99) | 2.37 (3.04) | 2.28 (3.22) | 2.97 (3.06) | 2.49 (3.05) | 0.73 | 0.54 |

**p < .05, *p < .01, **p <.001*****

AUDIT = Alcohol Use Disorders Identification Test; RTC ruler: Readiness to Change Ruler.

Primary analysis

*Intention to drink (see table 6.5 and figures 6.9 and 6.10)*

A one-way ANOVA was conducted to examine the effect of glass labels (condition: control, calorie and units, exercise equivalent, food equivalent) on intention to drink measures. There were no differences between groups on the number of drinks participants intended to consume in the coming week, [F (3, 141) = 0.75, p = 0.52, $\eta p^2 = 0.02$], or the likelihood they would get drunk in the next week, [F (3, 141) = 0.96, p = 0.41, $\eta p^2 = 0.02$].

Therefore the glass labels did not reduce intention to drink.

**Table 6.5. Means (±SD) for intention to drink by condition (N=142)**

| Variable | *Mean scores(±SD)* | | | |
|---|---|---|---|---|
| | *Control (N = 37)* | *Calories and units (N= 35)* | *Exercise equivalent (N = 36)* | *Food equivalent (N =33)* |
| Likelihood of drunkenness | 4.22 (3.47) | 3.20 (2.96) | 3.14 (2.10) | 4.30 (3.27) |
| Number of drinks | 5.81 (8.75) | 4.44 (5.05) | 3.53 (3.44) | 5.55 (5.54) |

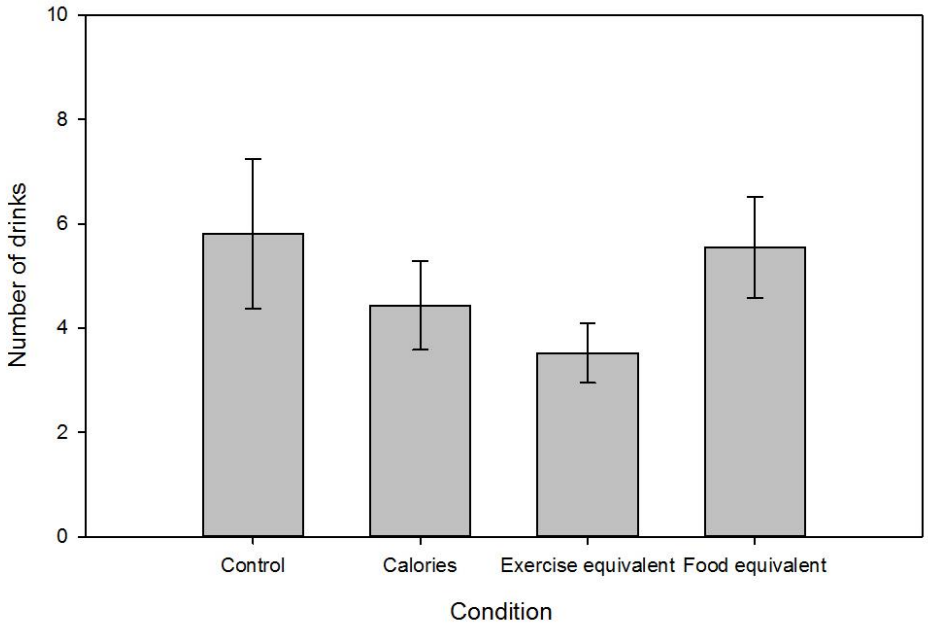



*Figure 6.9. Intended number of drinks in the next week, by condition. Error bars represent SE of the mean.*

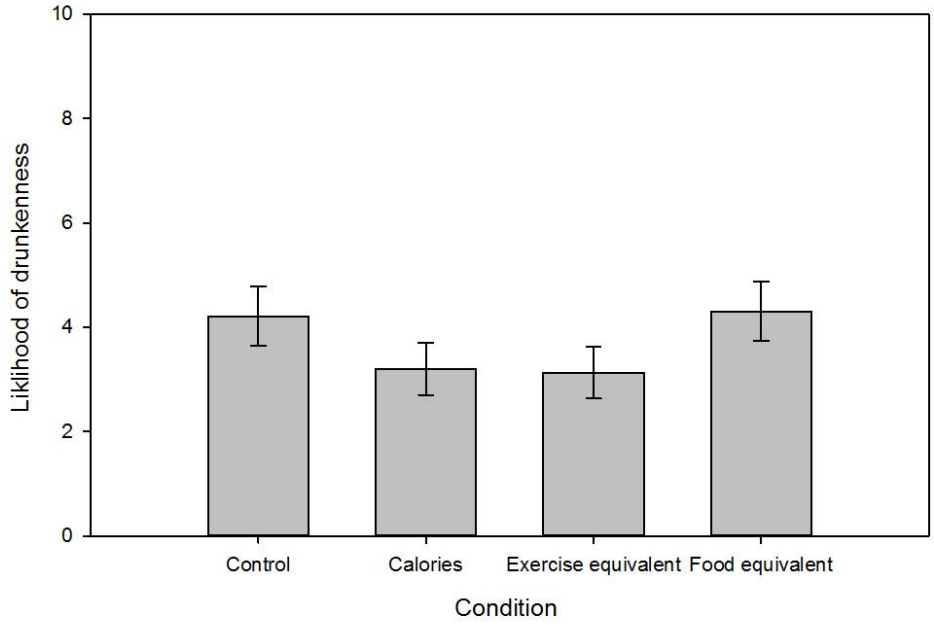



*Figure 6.10. Likelihood of drunkenness in the next week, by condition. Error bars represent SE of the mean.*

Correlational analysis (see table 6.6)

Correlational analysis assessed the relationship between intention to drink, AUDIT and RTC. A p-value of 0.01 was used to correct for multiple comparisons.

There were significant positive correlations between the number of drinks participants intended to consume and AUDIT scores ($r = 0.45$, $p = 0.001$) and the RTC ruler ($r = 0.28$, $p = 0.001$). There were significant positive correlations with likelihood of drunkenness in the next week and AUDIT scores ($r = 0.55$, $p = 0.001$) and the RTC ruler ($r = 0.33$, $p = 0.001$). There was a significant positive correlation between AUDIT scores and the RTC ruler ($r = 0.4$, $p = 0.001$).

**Table 6.6. Correlations between drinking characteristics and intention to drink**

| | RTC | Number of drinks | Likelihood of drunkenness |
|---|---|---|---|
| AUDIT | 0.40** | 0.45** | 0.55** |
| RTC | | 0.28** | 0.33** |
| Number of drinks | | | 0.76** |

**. Correlation is significant at the 0.01 level (2-tailed)

Recall

One-way ANOVA indicated that there were significant differences between groups for the amount of correct responses on the recall task, [F (3, 137) = 3.6, p = 0.015, $\eta p^2 = 0.07$]. Post-hoc t-tests indicated that the significant differences were due to differences between the control group and calorie labels (p = 0.002) and control group and food equivalent labels (p=0.04), with a higher recall in the control group (95%, compared to 80% recall for calories, 85% for food equivalent and 88% for exercise equivalent).

Exploratory post-hoc analysis

A 2 x 4 ANOVA was conducted to investigate the effect of gender (male, female) and the glass labels (condition: control, calorie and units, exercise equivalent, food equivalent) on intention to drink. The main effect of gender was non-significant for number of drinks, [F (1, 138) = 1.44, p= 0.23] and likelihood of drunkenness, [F (1, 138) = 0.87, p = 0.35].

## 6.5 Discussion

These studies are the first to investigate the effect of glass labels containing calories and units and the addition of food or exercise equivalents, compared to a control (a plain glass or volume information). Study Five investigated the effect of the labels in reducing alcohol consumption in a semi-naturalistic bar-laboratory setting and Study Six investigated the effect of the labels on reducing intention to drink in an online study. Results showed that there were no significant effects of the glass labels on ad libitum consumption over a 45-minute period and online study findings support this, there was no effect of engagement with the labels on intention to drink.

Findings from both studies do not support previous research into food labels which has found that physical activity information has led to reduction in purchases and food orders (Bleich et al., 2012; Dowray et al.., 2013) and consumption (James et al., 2015) compared to calorie labels alone. Labelling is described as a choice architecture intervention as it alters the properties of an object in the environment (Hollands et al., 2013). However, it could be argued that interaction with labels involves the reflective system; information has to be noticed and engaged with and a decision process is required for behaviour change (Strack & Deutsch, 2004). Reflective explanations of behaviour change assumes that once individuals have the information they will act in their own best interests, but this is often not the case, particularly when given in an environment abundant with drinking cues (Hofmann et al., 2008). Differing findings between results with alcohol compared to food research may be further explained by alcohol's effects on inhibition. Acute alcohol intoxication leads to an increased desire for alcohol, a 'loss of control' over drinking (de Wit, 1996). Furthermore, alcohol increases the salience of drinking cues in the environment and makes it more likely that long term goals will be forgotten (Hofmann et al., 2008). This is supported by the significant increases in urge across all conditions, echoing research showing increases in urge after alcohol consumption (Rose & Duka, 2006).

Another potential reason for the lack of any effect of information on drinking may have been gender differences. Findings from previous focus groups into unit labelling (Study Four) indicated that females utilised nutritional information when controlling alcohol intake. Furthermore, previous research has indicated that females often display different eating behaviours to males (Bryant, Darkes & Rahal, 2012), have a higher awareness and better nutrition knowledge (Kiefer, Rathmanner & Kunze, 2005) and another study has found females are more willing to change their levels of physical activity than male students (Von Bothmer & Fridlund, 2005). Therefore, we conducted post-hoc analysis to identify any gender differences in the effectiveness of nutritional labels on drinking behaviour. We found a marginally significant interaction in Study Five; in female participants the exercise equivalent labels reduced consumption. The significant differences were between the exercise labels and the calorie and unit labels, which suggests that unit and calorie labels may have a counterproductive effect and lead to increased consumption. This is supported

by focus group research suggesting that unit labels could increase consumption (Jones & Gregory, 2009). However, this finding must be interpreted with caution, the study was not powered to find gender differences or to identify alcohol information effects in women only and the findings were not supported by the exploratory analysis in Study Six.

Nevertheless, the potential gender differences are supported by the finding that men and women use different methods to prevent weight gain from alcohol. In one study, 11% of women were found to regularly exercise to 'burn off calories' from alcohol, whereas the use of exercise was the only weight-loss behaviour men did not use (Peralta, 2002). This suggests that there may be potential for the effectiveness of exercise equivalent labels in certain populations, but more research is needed and alternative methods for those in which the labels are not effective (e.g. young male adults) warrants further investigation.

In Study Five, participants scored an average of 41% correct responses at time one in the units and nutritional knowledge questionnaire. This supports previous research showing poor knowledge of calories in alcohol (Lloyd-Richardson et al., 2009) and food equivalents (Alcohol Survey for England, 2006; Isted et al., 2015a). At time two, alcohol knowledge significantly increased in all conditions. Participants were aware that they were required to complete the questionnaire again, therefore they may have been more aware of the relevant information on the glasses, and they had time to reconsider their previous answers, explaining why scores also increased at time two in the control condition.

In Study Six, participants were required to recall the information they viewed on the side of the glass with subsequent multiple choice questions. Correct responses were high, with participants in all groups responding correctly for the majority of questions. This suggests participants engaged with the information. Correct answers were significantly higher in the control condition (in which volume information was displayed) than food equivalents and calorie information, this may be because participants have pre-existing knowledge of volume information and it is commonly viewed on packaging, therefore more easy to remember. Calorie and food equivalent information is novel, therefore participants may have found it more difficult to give correct responses. Furthermore, these conditions displayed more information than the

control condition, therefore it may be that this was too much to retain. Future label comparison research should display matched amounts of information to ensure differences between groups are due to the content of the labels.

In Study Five, views of the glasses were investigated. Most participants did not believe the labels would influence their drinking behaviour, which supports main findings in both studies. Just under 20% of participants indicated that the labels would increase awareness, suggesting they may be useful in some individuals for self-monitoring purposes. However, self-monitoring is not sufficient to reduce alcohol intake (Maas, Hietbrink, Rinck & Keijsers, 2013), emphasising alternative methods in this population are needed for behaviour change.

Study Five found a significant negative correlation between consumption and restrained eating, indicating those who restrict calorie intake drank less beer. This supports previous findings into food consumption after a priming dose of food, in which the most restrained eaters are able to control their eating behaviour. Therefore, those higher in restraint may be more likely to restrict beer intake (Christiansen et al., 2016a). In Study Six there were positive correlations between AUDIT scores and RTC and intention measures, this supports findings from Study One (Clarke et al, 2015), in which RTC and AUDIT scores were positively correlated. This suggests that those who have more alcohol-related problems and a higher consumption are more likely to be looking to change behaviour. However, there were no significant correlations in Study Five between these drinking measures. Failure to replicate the association between RTC and AUDIT can be explained by mixed findings with RTC, as other research shows no associations between RTC and drinking (Borsari et al., 2009), indicating the relationship between RTC and alcohol is complex.

These studies had some limitations. Although only 6 participants fully guessed the aim of Study Five, the majority of participants indicated that they believed alcohol consumption was being measured. With food research it has been shown that heightened awareness of observation of food intake can reduce consumption of an energy dense snack in females (Robinson, Proctor, Oldham & Masic, 2016). This indicates individuals may change their behaviour to appear more ‘healthy’, therefore suggesting participants may react in a similar manner when they are aware their alcohol intake is being measured. However, urge was also measured, which is a less

explicit measure of alcohol behaviour and may not be affected in the same way as consumption. There were no significant differences in change in urge across conditions, suggesting awareness did not impact the results.

In Study Five there were significant differences at baseline between conditions in scores in the OEQ, with the control group scoring significantly higher. However, this was considered in the analysis and there were no significant correlations between alcohol consumption and OEQ scores, suggesting the different average scores between groups would not have had an impact on consumption.

As noted, the sample sizes in both studies are small. The post-hoc gender analysis in Study Five shows promising results but was not powered to find gender differences. Therefore, further testing in the effectiveness of the labels in reducing consumption is required to investigate any contrasts in findings between genders before strong conclusions can be drawn.

One weakness of the glass labels in both studies is that they may not have been aesthetically pleasing to participants, the labels were bold and covered a large proportion of the glass. Findings in Study Four (Chapter Five), suggested that participants preferred a subtle label design. However, a recent study looking at warning labels indicated that large alcohol labels attract more attention (Kersbergen & Field, 2017), therefore we wanted to ensure that labels were noticed and engaged with. Furthermore, we improved glass design compared to those used in Studies Three and Four by having a more simplistic design on drinking vessels that individuals are used to drinking from (i.e. pint glasses).

Another limitation is that the majority of the participants in both studies had low readiness to change scores. The aim of nutritional labelling is to increase awareness in individuals so they can change their behaviour to make healthier choices, however, if individuals do not want to change their drinking this information may be less likely to have an impact. Successful strategies that achieve behaviour change in those with low RTC are limited (Hardcastle et al., 2015). This may be particularly true for young student drinkers, who have a desire for a controlled intoxication (Measham & Brain, 2005), with pre-existing levels of consumption to reach a required drunkenness. This indicates that in this population, alternative choice architecture interventions that do not involve engagement with information, may be

more effective. For example, altering the functional design of an object, such as the size or the shape of a glass (Hollands et al., 2013), is an intervention that involves no conscious engagement from individuals.

These studies are novel, they are the first to measure the effect of calorie and food and exercise equivalent labels on ad libitum alcohol consumption and intention to drink. In both studies the labels were ineffective in changing drinking behaviour, however, in females there was a marginally significant reduction in drinking in the exercise equivalent label condition compared to calorie and unit labels which warrants further investigation. The definition of labelling as a choice architecture intervention is questioned, as although the information is provided in the immediate environment, a decision process is necessary to use nutritional information to make a rational decision and reduce consumption. Although the labels may increase knowledge and awareness, the use of alternative interventions in a young adult population are necessary for behaviour change, specifically choice architecture interventions that use methods requiring less conscious engagement.

# Chapter Seven (Study Seven)

## The effect of calorie and food and exercise equivalent labels on alcohol consumption: a qualitative investigation

This Chapter is supplementation to the quantitative findings from Chapter Six, drawing on findings from two focus group interviews to present social drinkers' (N= 14) perspectives and views in relation to their own drinking behaviour on the potential use of the labelled glasses (with calories and units and the addition of food or exercise equivalent labels) as a harm-reduction method.

## 7.1 Abstract

This exploratory qualitative study investigated the views of social drinkers on the labelled glasses with unit and calorie information and the addition of food or exercise equivalent information as a potential tool to reduce drinking. Two focus groups (N = 14) were conducted with social drinkers. A battery of questionnaires measured drinking habits, alcohol-related problems, readiness to change, drinking motives and dietary and exercise behaviours. Participants were asked questions regarding the glasses to encourage group discussion. Findings indicated that overall most participants showed support for the glasses and thought they could be useful for self-monitoring purposes, however fewer participants (mainly female) indicated that they might change behaviour. It was highlighted that the glasses may not be effective if provided in a real-life drinking environment. Participants indicated that the information on the glasses could be used in an unintended and potentially harmful way, therefore it is vital that additional measures are taken to prevent the misuse of nutritional and food/exercise equivalent information.

## 7.2 Introduction

Studies Five and Six showed that glass labels showing a range of information (unit and calorie, with the addition of food/exercise equivalents) did not reduce alcohol consumption or decrease intention to drink. Therefore, two focus groups were conducted to elaborate on and better understand these quantitative findings. The focus groups' aims were to examine perceptions and opinions of the labelled glasses and provide a unique insight into a young adult population's views on this particular type of harm-reduction strategy. The mixture of quantitative and qualitative methods to investigate this strategy gives a thorough and unique analysis that provides complementary results (Fraeymen et al., 2012). As outlined in Chapter Six (Study Five), there are several reasons why the labelled glasses may not have successfully reduced drinking; these were the drinking environment (e.g. alcohol cues, the consumption of alcohol), the nature of choice architecture interventions involving provision of information, and characteristics of the study sample used. The aim of the present study was to explore these issues and clarify the results of the experimental study.

As described in Chapter Five (Study Four), focus group interviews are a data collection method with an interactive approach that generate detailed information about certain topics chosen by the researcher. Compared to in-depth interviews they can allow for better reflection on collaborative experiences (Lunt & Livingstone, 1996) (see page 100 for more detailed description).

## 7.3 Method

Participants

Fourteen social drinkers (8 females; mean age 23 [SD ±4.69]) were recruited from the University of Liverpool via advertisements, word of mouth and using the university's online EPR system, to take part in one of two focus groups, which were single sex. Groups were separated by gender as it is reduces any problems of intergender dynamics (Hopthrow et al., 2007) and avoids discussion of potentially sensitive issues in mixed gender groups (Lindgren et al., 2009) (see page 101 for more detail). Exploratory post-hoc analysis in Study Five also indicated gender differences in the effectiveness of exercise equivalent labels in reducing drinking,

therefore we were interested in whether these gender differences were displayed in the focus groups. Inclusion criteria were fluency in English and weekly consumption of alcohol (mean weekly unit consumption: 27.55 [SD ± 21.28], UK alcohol unit = 25ml of a standard spirit = 8 grams of pure alcohol). An exclusion criterion was participation in the Studies Five and Six to ensure participants had not seen the glasses before. All participants provided informed consent before taking part in the study and received £5 reimbursement as compensation for their time. The study was approved by the University of Liverpool Research Ethics Committee.

Design

A qualitative focus group methodology was employed. Two focus groups (one male and one female group) were carried out.

Questionnaire Measures

These measures were taken after participation in the focus group to provide descriptive quantitative data on the alcohol consumption behaviour and drinking motives of the participants.

*Alcohol Use Disorders Identification Test (AUDIT, see Appendix 1 and page 32 for full description)* (Saunders et al., 1993). The AUDIT is a clinical screening tool designed to pick up the early signs of hazardous drinking (Babor et al., 2001).

*Timeline Follow Back Questonnaire (TLFB, see Appendix 2 and page 33 for a full description)* (Sobell & Sobell, 1992). The TLFB is a self-report measure which estimates weekly alcohol consumption in UK units and binge frequency (binge defined as: ≥8 units p/drinking episode in men, ≥6 units p/drinking episode in women [NICE, 2010]).

*Readiness to change contemplation ruler (RTC ruler, see Appendix 3 and page 34 for a full description)* (LaBrie et al., 2005). The contemplation ruler is a single item continuum measuring from 0-10 with 0 representing the statement 'I never think about my drinking' and 10 representing the statement 'My drinking has changed. I now drink less than before'.

*Modified Drinking Motives Questionnaire- Revised (DMQ-R, see Appendix 14 and page 102 for a full description)* (Grant et al., 2007). The DMQ-R is a 28 item, five

factor measure of drinking motives. Each item on the DMQ-R contributes to one of five subscales: social, coping-anxiety, coping-depression, enhancement, or conformity. Participants take into consideration all the times they drink and indicate how often they drink for the reason specified in each item on a 5-point Likert scale ranging from 1 (almost never/never) to 5 (almost always/always).

*The Dutch Eating Behaviour Questionnaire (DEBQ, see Appendix 16 and page 131 for a full description)* (Van Strien et al., 1986). The DEBQ contains 33 items with 3 subscales assessing restrained, emotional and external eating behaviour. Items are scored across a 5 point Likert scale with responses ranging from 'Never' to 'Very Often'. The subscales have high internal consistency and factorial validity (Van Strien et al., 1986). As in Study Five only the restraint factor was analysed as this is the scale most often associated with drinking behaviour (Caton et al., 2015).

*The Obligatory Exercise Questionnaire (OEQ, see Appendix 17 and page 131 for a full description*); Pasman & Thompson, 1988). The OEQ is a 20 item self-report questionnaire that assesses an individual's obligation to and compulsion for exercise. Items are scored across a four-point scale with responses ranging from 'never' to 'always'. Higher scores indicate more obligatory exercise behaviours.

Procedure

Participants were required to participate in one of two focus groups (split by gender). Each focus group lasted no longer than one hour. The focus groups were held in closed rooms on the University of Liverpool campus.

Upon arrival participants were each given an information sheet and provided informed consent. They were informed that the focus groups would remain strictly confidential and were each given a number before recording began so that they could not be identifiable by name. They were informed that discussions would be recorded and transcribed. A semi-structured interview guide of open questions was used to simulate discussion and obtain opinions and perspectives of participants. The focus groups were facilitated by a researcher whose role was to consider participants' responses and reactions to conversation, to signal approval and to remain open (Gronkjaer, Curtis, De Crespigny & Delmar, 2013). Three glasses with different labels (unit and calories, unit and calories with food equivalent and unit and calories

with exercise equivalent [see Figures 6.1-6.3 in Chapter Six (Study Five), page 132]) were introduced to the focus group. A script (see Appendix 20) was used which followed the questions used in Chapter Five focus groups (see Appendix 15). All focus groups were audio recorded and detailed notes were taken by an observer. After the focus groups had taken place participants were then given the questionnaire battery to complete and were fully debriefed. The session was transcribed immediately after.

## 7.4 Results

### Analysis

Focus groups were transcribed verbatim and analysed using NVivo 10, a qualitative analysis software (NVivo, 2010). The data set was analysed using thematic analysis, which involves familiarisation with the text, the identification and coding of themes relevant to the study purpose, the connection of categories and interpretation (Gronkjaer et al., 2013). The coding process is a dynamic process between the coder and the text during which themes of interest are developed, refined and coded (NyGaard & Paschall, 2012). The initial coding was undertaken by the main researcher (author) and was supported by a second researcher for reliability purposes. This Chapter is a full report of the themes that emerged.

### Participant characteristics

Descriptive statistics are presented in table 7.1. MANOVA indicated groups did not statistically differ on any of these factors (ps> 0.12). The sample was made up of 92.86% risky drinkers, identified by an AUDIT score of 8 or above (Babor et al., 2001). Groups did not differ in percentage of risky drinkers, [$\chi^2$ (14) = 1.44, p = 0.23]. The mean score on the ruler was 3.5 (SD ±2.47), this score lies between 'sometimes I think about drinking less' and 'I have decided to drink less'. Average response on the OEQ overall was 42.93 (±10.47), a score which compares to other student samples (e.g. M = 41.68 in Chalk et al., 2013). Average score on the restrained subscale was 2.57 (SD ±1.22), a score which lies between 'never' and 'seldom', suggesting low restraint overall. The current study had significantly higher AUDIT scores (p < 0.001) and significantly lower weekly binges (p = 0.03) than Study Five drinking characteristics, but did not differ on any other factor.

*Drinking Motives*: For the DMQ-R subscales participants were highest on the social subscale, then enhancement, then coping-anxiety, then conformity and coping-depression.

**Table 7.1. Means (±SD) for participant characteristics overall and by gender (N=17)**

| | *Mean scores(±SD)* | | | *Statistics (MANOVA)* | |
|---|---|---|---|---|---|
| Variable | *Female (8)* | *Male (6)* | *Overall (14)* | *F* | *p* |
| Age (y) | 21.88 (4.02) | 24.5 (5.47) | 23.00 (4.69) | 1.08 | 0.32 |
| Weekly units (TLFB) | 21.29 (15.62) | 35.91 (26.26) | 27.55 (21.28) | 1.71 | 0.22 |
| Weekly binge (units) (TLFB) | 1.56 (1.08) | 1.67 (1.03) | 1.61 (1.02) | 0.03 | 0.86 |
| AUDIT (0-40) | 16.63 (5.45) | 16.17 (7.83) | 16.43 (6.30) | 0.02 | 0.90 |
| RTC ruler (0-10) | 4.25 (2.49) | 2.50 (2.26) | 3.5 (2.47) | 1.83 | 0.20 |
| *DMQ-R:* | | | | | |
| Social (1-4) | 3.10 (0.26) | 3.20 (0.57) | 3.14 (0.4) | 0.20 | 0.66 |
| Coping-anxiety (1-4) | 2.47 (0.69) | 1.88 (0.63) | 2.21 (0.71) | 2.75 | 0.12 |
| Coping-depression (1-4) | 1.47 (0.64) | 1.31 (0.38) | 1.40 (0.53) | 0.29 | 0.60 |
| Enhancement (1-4) | 2.63 (0.58) | 2.80 (0.42) | 2.70 (0.51) | 0.39 | 0.54 |
| Conformity (1-4) | 1.50 (0.44) | 1.27 (0.35) | 1.40 (0.41) | 1.14 | 0.31 |
| Restrained eating (1-5) | 2.99 (1.08) | 2.02 (1.25) | 2.57 (1.22) | 2.42 | 0.15 |
| OEQ (20-80) | 43.00 (8.02) | 42.83 (13.96) | 42.93 (10.47) | 0.001 | 0.98 |

TLFB = Time Line Follow Back; Weekly binge = number of binge drinking episodes per week; AUDIT = Alcohol Use Disorders Identification Test; RTC ruler: Readiness to Change Ruler; DMQ-R = Modified Drinking Motives Questionnaire; OEQ = Obligatory Exercise Questionnaire

Main themes

Data was coded into 5 main themes: general views (positive), general views (negative), impact of labels on drinking behaviour, reference to weight or food and potential misuse of the labels.

In the subsequent theme description (based on Penny & Armstrong-Hallam, 2010), italics are used to present participants' comments verbatim and the use of a dotted line is use to represent material that has been excluded from the quote.

**General views**

In this theme, general views are divided into positive and negative views. These both contain two subthemes: aesthetics and content.

*1. Positive views*

Aesthetics

There were some positive views of the labels. Participants emphasised that they would notice the labels, because they were novel, particularly the food and exercise equivalents. They described them as *'attention grabbing*', with the addition of the pictures making the labels more '*noticeable*'. One participant said that the glass with this information on looked '*cooler*', than if it were a branded glass.

Content

Many participants said that they thought that it was beneficial to give individuals as much information as possible, although it was often emphasised that this was for those that '*do want to help themselves'*, rather than for their own benefit. Participants thought having the information was '*probably more effective there in front of you'* and would be a reminder each time a drink was consumed.

*2. Negative views*

Aesthetics

There were negative views on the glasses, in terms of the aesthetics participants said that the labels were '*in your face*', with the '*average guy down the pub*' not likely to

have the labels on their glass. Another participant said that the labels looked like something they '*wouldn't notice'*.

Content

In terms of the information, it was emphasised that individuals would become accustomed to the information or not pay attention. Furthermore, specifically with the food equivalent label it was raised that there was '*a danger of misinformation'*, due to the calories in food being broken down differently to those in alcohol. One participant said they would not use them because the content '*would upset*' them and others said that if they could choose not to use them they would as '*it's killing all the joy of drinking'* and if glasses like this were used in pubs they would '*kill the pub industry'.* Participants also said it may be difficult to have similar labels for different types of drinks, for example with shots, as '*you just do it and then it's gone'* therefore individuals may not look at beverage containers for long enough to notice the labels.

**Impact of labels on drinking behaviour**

This theme relates to the perceived effectiveness of the labels in changing drinking behaviour. It is split into four subthemes: unit monitoring, alcohol consumption, effectiveness of the labels in a drinking environment and controlled intoxication.

*1. Unit monitoring*

Most participants said they did not often think in terms of units and that if the labels consisted of unit labels alone they would not understand their meaning, '*I think…you're drinking more units than you think you are. But I don't know what the recommended thing is anyway'.* They said having unit information would '*make you think how many you were going to have'.* If participants did monitor it was purely '*out of curiosity'*, rather than to change behaviour.

*2. Alcohol consumption*

Many participants said that the labels would impact their consumption, and this was mainly in female participants. In the female group, the majority of participants said that if they were given the glass to drink from it would influence their alcohol consumption; they would '*drink less*', have a '*smaller one'* or '*still drink it but only*

*have one'*. One participant said they would not drink at all *'if I had a drink and it said there were this many calories in it I wouldn't drink it'*. There were mixed views as to which label would be most effective. Some thought the food equivalent label would be most effective, participants said '*it would put you off drinking more because you'd be like oh my god this is 3 mars bars now*' and '*I would rather eat a mars bar',* whereas others said the exercise equivalent would be most effective, one participant said '*if I had to run for 23 minutes to have a drink I might be tee total'*, although another said that they'd be '*dancing it off anyway so don't really care'*.

In males the views on the potential effectiveness of the glasses were not as positive, participants said that although they would be happy to drink from glasses with these labels they did not believe it '*made that much difference', 'wouldn't change behaviour'*, and that this type of information has '*never changed how I've behaved. Just pure curiosity*'. One participant said it would be the units rather than the calories that would be a deterrent '*if I had this in front of me every time I had a drink, 2.8 units that would be a deterrent'*. Male participants were more likely to say the exercise equivalent information was more impactful than food equivalent, '*if I look at 23 minutes, I would pay more attention than just calories'* and *'if you took out the units and calories, and just left the running. That's more effective maybe'*. Male participants also highlighted that there would be gender differences '*I don't think a lad would worry about high intake of calories. But…female friends who are on diets will stay away from beer and wine'.*

*3. Effectiveness of the labels in a drinking environment*

In both groups it was emphasised that the potential effectiveness of the labels might reduce once individuals started drinking, with '*the chances of caring'* getting '*less and less with every drink you have'* and that '*many people, especially students, would just drink anyway…with alcohol you're going to get drunk, so with food it's not as rewarding as getting drunk apart from the hangover'*. One participant said that '*after 6 pints, the apocalypse wouldn't be a deterrent for me. Binge drinking seems to go like that*' and '*that's the thing with alcohol, you can give a tonne of information, but once the intake is enough all the information is irrelevant'*. Furthermore it was emphasised that '*people would get used to it. They'd just get used to it and block it*

*out. Plus if you saw that information on a night out, I don't think you'd really pay attention to it'*.

*4. Controlled intoxication*

There was an emphasis on controlled intoxication, or drinking to get drunk. Participants felt that for most individuals, the aim of drinking is to get drunk, therefore this information would not affect behaviour. This was emphasised to be particularly the case for students, *'I don't think it would really stop students from drinking. I think they're still going to drink how many calories and units will get them drunk'.* This was the case even though '*you know the effects of it and you do it anyway*'. Rather than reducing levels of drinking participants felt it would '*quantify how drunk you get'*.

**Reference to weight or food**

This theme relates to participants' views on the labels in relation to their potential impact on eating behaviour and links with weight. It is split into three subthemes: calorie counting, weight and impact on eating behaviour.

*1. Calorie counting*

In terms of calories, most females stated that they did consider how many calories they were consuming in food, '*I do measure what I eat*'. However, this was not often transferred to drinks '*I wouldn't want to know how many calories (are in drinks)'* and '*people know there's calories in alcohol but they don't think about it as much as food', 'if you eat a chocolate bar you know there's loads of calories in that but in a drink you're not necessarily thinking about it as much'*. Participants said if they did think about it then they would focus on getting '*healthier drinks in, with lower calories'*. It was emphasised that particularly as students would not count calories, having unhealthy food equivalents may be more helpful, as '*they know that obviously a mars bar is not healthy'*. The majority of males did not count calories, and even those that did monitor them in food would ignore calories in drinks '*when it comes to drinks, specifically alcoholic drinks it is more like a treat. So I would rather have a pint than a chocolate bar. So I would just have it and not really care'*. It was emphasised that it may impact those that do count calories '*a person who is interested in calorie will know exactly what it means. Maybe they will ponder it. Me I*

*won't'*. Some participants seemed surprised at the number of calories in drinks, claiming that '*227 calories is not much in my book'* and comparing this amount to food and daily intake, *'do 5 pints and it's only 1000 calories, which is half a McDonalds I assume. Not too bad'.* This explains reasons for participants' views that the food equivalent label would be effective, as when comparing the drink to a mars bar, as *'it makes me think, that's not good for you'*, even if the calorie amount '*isn't that bad'*.

*2. Weight*

It was highlighted that having calorie information would be useful for those who are weight conscious, '*if I was an overweight person, even if I was male, it would make a difference'* and would '*help the obesity problem more than it would help the drinking problem*'. Participants recognised that the calorie information made them anxious about weight, whereas the unit content was not a concern. This is because '*ultimately people are most bothered about what they look like…everybody cares more about not getting fat really, than they do about having an unhealthy liver. Because you can't see that'*. A comparison to the food industry was made, as it was suggested the alcohol industry would follow the food industry by marketing '*healthier'* drinks; '*the same thing is happening in the food industry…all the companies are lowering their sugar and their salt because there is a big drive for people to eat healthier foods'.*

*3. Impact on eating behaviour*

Some participants said the labels, particularly the food equivalent information, would make them want to '*not touch (the drink) and eat a mars bar*', whereas others said that it may prevent them from eating particular foods, '*this may even convince people to cut down on actually eating other things. So they can drink more alcohol. I would rather have a pint than a bit of cheesecake*'. Furthermore, participants recognised the impact drinking has on increasing eating behaviour, '*what do you follow 4/5 pints with. A huge disgusting hamburger and a lot of fries*'.

**Potential misuse of labels**

This theme relates to the potential for the use of the labels in an unintended and potentially harmful manner.

Participants voiced concerns over the way in which the glasses could be used in the wrong way. Firstly, they said the glasses could be used to create drinking games, for example to '*see how many units you can add up. Once you put the numbers (labels) on it, it allows for that'*. This was said to be '*mainly in boys, as boys are more competitive'* and student populations. The view was that rather than cut down alcohol intake this information would change individuals' choice of drink, for example a switch to spirits, because they are '*healthier to drink'*, which is '*a good thing obesity wise'*. However, it was recognised that this may lead to a higher unit consumption. One participant raised their concern that individuals may even turn to drugs because they have no calories, *'I have a friend and she hates…how many calories are in drink so she takes drugs instead'*. Another potential harm is the choice to drink in place of consuming food '*I would rather have a pint than a bit of cheesecake*'. However some participants said seeing the label with a food equivalent would lead to a craving for that food, and they would consume both the food item and alcohol '*if I'm going to drink I may as well have a mars bar'*.

### 7.5 Discussion

The aim of this study was to use focus groups to examine social drinkers' perspectives and views, in relation to their own drinking behaviour, on the potential use of calorie and unit labelled glasses and the addition of food and exercise equivalent as a harm-reduction method.

Firstly, drinking and dietary patterns were investigated. Baseline characteristics indicated that the majority of the sample (92.86%) were risky drinkers, defined by an AUDIT score of 8 or above (Babor et al., 2001). Participants had relatively low readiness to change scores, indicating most were not wanting to change their behaviour. Average scores for the DMQ-R indicated that individuals reported drinking mainly for social and enhancement reasons, supporting previous research showing social motives for drinking are consistently rated higher than other drinking motives (Cooper, 1994), particularly in students (Kuntsche et al., 2005). Average scores on the DEBQ indicated that females were more likely to be restrained eaters, whereas males were more likely to be external eaters. Restrained eating is defined as eating that relies on cognitive strategies for regulation of eating behaviour, rather than internal sensations (Heatherton & Polivy, 1992). This supports previous

findings in an undergraduate female sample which indicate they are more likely to be restrained eaters than males (Bryant et al., 2012). Mean scores on the OEQ indicate that participants mainly indicated that they exercised occasionally.

There were positive views on the glass labels. Participants thought the labels were noticeable and possessed the view that it is beneficial to give individuals as much information as possible. Although both groups said that the information was useful, female participants were more likely to indicate that they believed the glasses would change their behaviour. They perceived the food and exercise equivalent labels as being most effective due to the relatable and impactful nature of the information. It is promising that the information was viewed as being potentially effective, however, this does not necessarily mean it would change behaviour. For example, research into food nutrition labels indicates that although 88% report the labels would eventually affect choices, only 39% report actually using the information (Martinez, Roberto, Kim, Schwartz & Brownell, 2013). In males, although it was emphasised that for self-monitoring purposes the label information might be helpful, the majority did not believe they would lead to behaviour change. Although self-monitoring has been shown to be successful in decreasing many unwanted behaviours, for example eating unhealthy snacks, it has not been shown to be effective in reducing alcohol intake (Maas et al., 2013). Therefore although participants believe monitoring their intake of drinks using calories may be useful, in terms of reducing drinking it is questionable as to whether the labels have any benefit. This is supported by findings from Study Five and Six (Chapter Six) that overall the labels did not lead to a reduction in alcohol consumption or intention to drink.

The gender difference in findings is supported by post-hoc exploratory analysis in Study Five which showed a marginally significant effect of the exercise equivalent labels in reducing consumption. Research indicates women are more likely to have a higher awareness and better nutrition knowledge than men (Kiefer et al., 2005) and are more likely to be restrained eaters (Luce, Crowther, Leahey & Buchholz, 2013), who intend to eat less than desired and struggle to control their eating (Shapiro & Anderson, 2003). Therefore, gender differences warrant further investigation.

It was acknowledged that although the labels may be viewed as useful prior to alcohol consumption, in a drinking environment and once drinking is initiated this

may differ. For example participants emphasised that after a few drinks this attitude may change. This is supported by research showing the influence of an alcohol dose on behaviour; a moderate dose (0.6g/kg) can increase choice of alcoholic drinks and self-reported desire for alcohol (Rose & Duka, 2006). Furthermore, the ability to refuse alcohol is lower in a bar-laboratory compared to a lecture environment (Monk & Heim, 2013b), therefore views could be different once individuals are in their typical drinking context. This is supported by Study Five (Chapter Six): consumption was not affected by the labels in the bar-laboratory, highlighting the importance of assessing this type of information in a naturalistic drinking setting.

The lack of unanimous consensus amongst participants regarding the ability of the glasses to change consumption could be a reflection of the drinking and dietary characteristics of participants. Participants who did not believe these labels would be useful for them, did emphasise that this type of information may be useful for certain individuals, for example those who are weight conscious or want to cut down. This supports food research, where students emphasise nutritional information is important for consumers in general, but not for themselves (Martinez et al., 2013). It also supports findings from Study Four (Chapter Five), where one reason suggested for the label ineffectiveness were the characteristics of the young adult population, such as low readiness to change; many interventions are unlikely to be effective in those who are not ready to change their drinking behaviour (Hardcastle et al., 2015).

Echoing results from Study Four (Chapter Five) was the participants' pursuit of 'controlled intoxication'. This is described as a desired level of intoxication (Measham & Brain, 2005), in which student drinkers have been shown to monitor their drinking by using internal and external signals to stop or slow down (McEwan et al., 2011). These are personal guidelines, not based on existing recommendations (Measham & Brain, 2005). This is supported by the finding in the focus group that participants already had a predefined amount of drinks that they planned to consume. If alcohol choice is predefined before drinking (Martinez et al., 2013) and individuals have a set level of intoxication that they are planning to reach, then nutritional information at the moment of consumption may not be sufficient. Although useful, individuals should receive this information in other forms and additional efforts are required to change the drinking culture which perceives a need for 'controlled loss of control'.

Participants highlighted that there was potential for the misuse of the provision of this type of information. Amongst female participants especially, it was indicated that drinks with lower calories but a high alcohol content may be sought out. Many participants had the view that nutritional labels would be beneficial in helping the obesity crisis rather than society's alcohol problem as unit consumption may remain unchanged even when swapping to lower calorie drinks. It was indicated that this information may assist individuals in reducing their food intake to compensate for the calories in alcohol. Characteristics of the female participants in this focus group support this finding, as they were most likely to be restrained eaters. These are not new concerns, recent research and media attention has focussed on 'drunkorexia', a non-medical term used to describe diet related behaviours that are related to and used to compensate for the consumption of alcohol and its calories (Burke, Cremeens, Vail-Smith & Woolsey, 2010). A recent study indicated women are more likely than men to report these compensatory behaviours (although men still used them), for example by eating smaller quantities or low calorie food and skipping meals prior to and after drinking alcohol (Bryant et al., 2012). This behaviour is used to avoid weight gain and enhance the effects of alcohol (Burke et al., 2010). In a female population, it is particularly important to consider the risks of this information in encouraging the potential switch to lower calorie (but higher alcohol) drinks such as spirits (Butriss, 2014).

The use of food and exercise equivalents (in addition to calorie information) may also have the potential to increase the likelihood of these behaviours. Participants may replace specific food items with alcohol, as they have an easy comparison. This is a problem as a calorie's worth of food is not the same as a calorie's worth of alcohol, different physiological pathways are stimulated and they have different calorific effects (Lucan & DiNicolantonio, 2014), and this was highlighted in the focus groups. The exercise equivalent labels could encourage excessive exercise, as individuals have an indication of the time period needed to burn off calories. Research indicates that excessive exercise is another type of behaviour associated with 'drunkorexia' (Gadalla & Piran, 2007), one study showed that almost 11% of women exercised to burn off the calories from alcohol (Peralta, 2002). Furthermore greater alcohol use has been associated with greater exercise fixation and frequency in women (Chalk et al., 2013). In the focus groups female participants did indicate

that activity to burn off calories was something they considered even during a drinking occasion, as one participant said they did not worry about the calories as they were 'dancing them off'. 'Drunkorexia' behaviours are associated with higher alcohol-related harms, such as memory loss, injury and unprotected sex (Giles, Champion, Sutfin, McCoy & Wagoner, 2009).

The possible use of the labelled glasses for drinking games (for example to see how many units and calories could be consumed) was another concern that was voiced, particularly for male students. This supports findings from Study Four (Chapter Five) investigating views of the provision of unit information on Drink Wise glasses. Drinking game participation is associated with increased levels of alcohol use and negative alcohol-related consequences (Grossbard et al., 2007). Focus group findings investigating unit labels have also suggested they could be used to select stronger beverages and increase consumption (Jones & Gregory, 2009). Providing this information to individuals is important, despite concerns over 'drunkorexia' behaviours and drinking game use, as if individuals wish to limit their drinking they should have access to relevant information that may be of benefit. However, this stresses the importance of pairing the labels and nutritional information with efforts to highlight the importance of healthy eating, educating about the dangers of drinking to excess, or drinking on an empty stomach (Giles et al., 2009).

As discussed in Study Three (Chapter Four) labelling is an example of a choice architecture intervention as it alters the properties of an object in an environment (Hollands et al., 2013). Focus group findings suggest that in this population the information provided on the glass could potentially be useful for some individuals but it was emphasised that once in a drinking environment these labels will be less likely to have an impact on behaviour. This therefore supports the findings from Studies Three and Five, showing the ineffectiveness of glass labels in reducing consumption. This may be due to the environment containing drinking cues and involving the consumption of alcohol, which may decrease the likelihood that individuals will act in their own best interests (Hofmann et al., 2008). Labelling differs from other subtler choice architecture interventions (such as altering the structure of an object, e.g. glass shape, or placing cues in the environment [Hollands et al., 2013]) as individuals still need to engage with and process information for it to have an effect, which requires cognitive effort. This could explain why the strong

influence of existing aspects of the environment (which usually override our reflective system [Liu et al., 2014]) may have been too salient for the labelled glasses to exert any effect. In this population it may be that choice architecture interventions which involve less conscious effort for behaviour change may be more effective. In theory, such 'implicit' interventions could have an effect regardless of whether an individual wants to change their drinking.

A limitation of the current study is that the study sample were volunteers who were aware of the purpose of the focus groups, therefore they may have been interested in the topic. The majority were also students, so may have been more likely to understand and utilise nutritional information and food and exercise equivalents than the general population. Therefore, although for the purpose of this research we are interested in developing interventions for this population, it would be of interest to investigate the views of the labels in a more diverse range of participants. A further limitation is that participants had a significantly higher AUDIT score and weekly binge score than participants in Study Five. However, both groups had an average AUDIT score indicative of risky drinking and student drinking has been shown to significantly fluctuate depending on time of year (Hoeppner et al., 2012).

A positive finding from these focus groups is that many individuals (particularly females) viewed this kind of information as being beneficial and potentially effective in reducing their alcohol intake. However, to what extent these findings relate to behaviour is unclear, and participants did emphasise that these views may change once in a real world drinking environment. This is supported by findings from Studies Five and Six (Chapter Six) which showed that the labelled glasses did not reduce drinking. It may be that in different populations, e.g. those who were weight conscious or trying to cut down their drinking, these labels may be effective, and this was highlighted in the focus groups. The potential harms associated with displaying this type of information are issues that should not be taken lightly, and measures to prevent the misuse of the labels needs further investigation. Accurate nutritional information and food/exercise labelling is important for education purposes (as with food products) but in combination with alternative choice architecture interventions, such as altering glass shape or placing cues in the environment, that may be more effective for behaviour change in the current population.

# Chapter Eight (Study Eight)

## The effect of glass shape on drinking rate in a naturalistic environment

## 8.1. Abstract

Choice architecture, or nudging, deliberately shapes the immediate environment to produce behaviour change. Glass shape is an example of a choice architecture intervention, and in a lab environment it has been found that individuals consume alcoholic drinks significantly slower from a straight glass, compared to a curved. The current study aimed to investigate the effect of glass shape in a semi-naturalistic drinking environment, with pairs of social acquaintances in a bar-laboratory. We expected drinking rate to be slower from a straight glass. One-hundred and sixteen pairs of social drinkers (aged 18-35) attended a single experimental session in a semi-naturalistic bar-laboratory setting. A battery of questionnaires measured drinking habits, alcohol-related problems, readiness to change (RTC), and alcohol urge. Pairs were randomised to consume 250mls of beer (1 unit) from either a straight or curved glass (between subject factor) whilst watching a sports clip. Due to drinking imitation within pairs the population was clustered, therefore a multilevel modelling approach was used for analysis. Findings showed there were no significant differences in drinking speed between the curved and the straight glasses. There were no interactions between glass shape condition and drinking characteristics. Glass shape does not appear to influence drinking rate in a semi-naturalistic drinking environment and this is suggested to be due to the strong influence that a pro-drinking context has on behaviour.

## 8.2. Introduction

The harmful consumption of alcohol and other health behaviours can be framed in terms of a conflict between impulsive and reflective processes (Strack & Deutsch, 2004). Impulsive processes often take precedence over the reflective system, particularly in an environment with stimuli that has a strong incentive value, for example drinking cues in a bar (Hofman, Friese & Wiers, 2008). Targeting the automatic system with more implicit interventions, that alter the immediate environment, may be more successful in altering behaviour, compared to targeting the reflective system. Choice architecture, or nudging, deliberately shapes the immediate environment to target our impulsive system and produce behaviour change (Thaler & Sunstein, 2008). Such interventions may be particularly beneficial for certain populations, such as young adult and student drinkers who show limited willingness to change behaviour (Caldwell, 2002). Individuals who are not motivated to change will be unlikely to engage in health related behaviours or attempt to override the automatic system that guides their behaviour (Hardcastle et al., 2015). Therefore altering the environment to encourage healthier choices may be more beneficial.

A recent paper introduces a typology of choice architecture interventions, describing them as those that alter the properties of objects or stimuli, their placement or both (Hollands et al., 2013; see page 13 for full overview of this typology). One type of intervention alters the functional design of an object in the environment. For example, with drinking, particular interest has focussed on the size and shape of a glass and its effect on consumption rate and pouring. It has been found that participants (including professional bartenders) pour 20-30% more alcohol into short, wide glasses than tall, slender ones, despite believing they pour more into the tall glass (Wansink & van Ittersum 2003; Wanswink & van Ittersum, 2005). This bias is suggested to be due to the perception that tall glasses hold more liquid than wide glasses (Raghubir & Krishna, 1999), as participants focus on the height the liquid reaches, without compensating for the width of the glass. Research in drinking establishments has also found an over-pouring effect with larger shot glasses and larger glasses (such as pints) having larger pours (Kerr et al., 2009). Daily wine purchase is higher when sold in larger glasses compared to standard-sized glasses (Pechey et al., 2016) and wider wine glasses and glasses matching the colour of the

wine lead to over-pouring (Walker, Smarandescu & Wansink, 2014). The majority of research into glass shape and size has focussed on pouring accuracy. Although this is relevant as it is suggested individuals consume most of what they have poured for themselves (Wansink & van Ittersum, 2005), we cannot say for certain that individuals will consume the entire drink. Furthermore, often drinks will be poured for us (e.g. in restaurants and bars), thus it is important to measure actual consumption and rate of drinking across different glass shapes.

In the first study to explore the effect of glass shape on alcohol consumption, it was found that in laboratory conditions, alcohol was consumed more slowly from a straight glass than a curved glass (12 minutes compared to 7 minutes). Participants also under-estimated the true half-way point of a curved glass to a greater degree than a straight glass (Attwood et al., 2012). In this study 160 participants were allocated to one of eight groups, either drinking a half-filled or a full glass of soft drink or alcohol (beer) from a straight or curved glass of equal volume (12 fl oz). The significant differences in drinking speed were found only in the alcohol condition and from a full glass. The proposed hypothesis is that in a curved glass, the majority of the volume is contained in the upper portion of the glass, therefore leading to a perceptual bias; with an under estimation of the true half-way point, and therefore a higher drinking rate. It is suggested that the slower rate of drinking when using a straight glass is likely to lead to reduced intoxication and reduced overall consumption, compared to drinking from a curved glass (Troy, Maynard, Hickman, Attwood & Munafò, 2015). This proposed mechanism is supported by a recent study indicating that participants consume their drinks more slowly from a curved glass with a marked midpoint than an unmarked glass (Troy et al., 2016). Further support for the influence of the shape of a glass on perceived volume comes from an online study (Pechey et al, 2015), which demonstrated that shape and capacity of wine glasses can influence perceived volume, with participants under-filling a wider glass and over-filling larger glasses. This suggests that structural changes to our drinking environment can influence drinking rate.

From a public health perspective glass show shape is an intervention that could easily be implemented. However, one potential issue with altering glassware in pubs or bars is acceptability, as glasses are often important as a marketing tool (Stead et al., 2014). When marketing beer, novel glassware and branding is often used to appeal to

the drinker (Schult, 2014). As well as being aesthetically pleasing it is also suggested to have functional benefits such as making the beer taste better. This is particularly relevant with the increase in the consumption of craft beer (Department for Communities and Local Government, 2015), where glasses have been suggested to be important for serving quality as well as for aesthetic reasons (Schultz, 2014). This suggests getting customers to change their glassware may be difficult. If patrons are unhappy with new glassware, they may take their custom elsewhere. However, in a recent study (Troy et al., 2015), a low percentage of patrons in pubs objected to using straight glasses. Furthermore, these study findings supported previous findings with glass shape, as monetary takings were 24% lower when straight glasses were used (however these findings must be interpreted with caution as this was a feasibility study). This indicates glass shape is a potentially accepted route for interventions but it is vital findings are experimentally evaluated in a variety of settings before they are introduced in the real world.

Individuals usually consume in the company of others; a study investigating the nature of typical drinking occasions found that between 2009-2011, 84% of drinking occasions involved drinking with others (Ally et al., 2016). This may be particularly the case for young adults, who mostly drink for social facilitation, and to improve social gatherings (Kuntsche et al., 2005) and it has been found that the more undergraduates are motivated to drink by social and enhancement factors, the more often they drink (Mobach & Macaskill, 2011). Furthermore, although on-trade drinking (drinking alcohol from venues such as pubs, nightclubs and hotels) is decreasing (IAS, 2013a), a significant proportion of drinking occasions still involve on-trade drinking (Ally et al., 2016). In this study it was found that high risk drinking occasions (>12 units females, >16 units males) were likely when drinking with friends or colleagues and when drinking switched between on- and off- trade. This shows drinking in the company of others and in a bar or a pub is common, and may be more likely to lead to risky drinking.

In Attwood and colleagues (2012) study, participants consumed their beverage alone in a lab environment whilst watching a nature documentary which is not a typical drinking situation. Given that a bar-laboratory makes the ability to refuse alcohol difficult (Monk & Heim, 2013b), increases alcohol consumption compared to a neutral lab (Moss et al., 2015) and that the presence of others influences drinking rate

(Larsen et al., 2010), it is important that these findings are replicated in a more naturalistic drinking environment. To maximise the applicability of results to real world drinking behaviour, this study investigated drinking speed from a curved or straight glass with pairs of social acquaintances in a bar-laboratory. It was hypothesised that in this semi-naturalistic drinking environment, drinking rate would be slower from a straight glass compared to a curved glass.

## 8.3. Method

Participants

One-hundred and twenty participants (70 female; mean age 21.23, SD± 3.38) were recruited in pairs (with 16 male pairs, 26 female pairs and 18 mixed gender pairs) from the University of Liverpool via advertisements, word of mouth and using the university's online EPR system. Participants were required to bring a friend who fit the inclusion and exclusion criteria. Inclusion criteria were fluency in English and weekly consumption of alcohol (mean weekly unit consumption: 26.27 [SD ± 17.51], UK alcohol unit = 25ml of a standard spirit = 8 grams of pure alcohol). All participants provided informed consent before taking part in the study and received £5 reimbursement as compensation for their time. The study was approved by the University of Liverpool Research Ethics Committee.

Power calculation

As the sample was recruited in pairs (therefore individuals' drinking behaviour is likely to be nested in the pairs) and previous research shows pairs imitate drinking (Larsen et al., 2010; Larsen et al., 2012b), the data is clustered. Therefore the design effect formula was used to calculate sample size (Ukoumunne, Gulliford, Chinn, Sterne, & Burney, 1999). An intra-class correlation of 0.6 was used, based on previous pair drinking studies (Koordeman et al., 2011; Koordeman et al., 2012) and the following formula was used:

$$DE\ (Design\ Effect) = 1+(n-1)p$$

*p=intra-class correlation*

*n = number of p's in group or average cluster size (in this case 2 as it is a pair)*

A previous study found a large effect of glass shape (Attwood et al., 2012). A power calculation showed that to detect a large effect we would need 52 participants. Multiplying the sample size by the intra-class correlation gives a new sample size of 84 participants for a large effect. Therefore we decided upon a sample size of 120 (60 pairs) for the current study to detect a medium to large effect.

Design

This study was a between subject design. Each pair was randomly assigned (stratified by same gender and mixed gender pairs) to either the curved glass or straight glass condition.

Questionnaire Measures

*Pair Relationship Information (PRI, see Appendix 11)* (Dallas et al., 2014*).* This is an instrument to gain information on the degree of friendship between pairs. Questions included how long participants have known each other (given in months or years), how close they are as friends, how much time they spend together, how well the pairs know each other, how similar they are to each other (5 point Likert-scaled response, 'strongly agree' to 'strongly disagree'). Points on the Likert scale were totalled to obtain an overall score for relationship 'closeness', with a lower score indicating greater closeness.

*Alcohol Use Disorders Identification Test (AUDIT, see Appendix 1 and page 32 for full description)* (Saunders et al., 1993). The AUDIT is a clinical screening tool designed to pick up the early signs of hazardous drinking (Babor et al., 2001).

*Timeline Follow Back Questonnaire (TLFB, see Appendix 2 and page 33 for a full description)* (Sobell & Sobell, 1992). The TLFB is a self-report measure which estimates weekly alcohol consumption in UK units and binge frequency (binge defined as: ≥8 units p/drinking episode in men, ≥6 units p/drinking episode in women [NICE, 2010]).

*Readiness to change contemplation ruler (RTC ruler, see Appendix 3 and page 34 for a full description)* (LaBrie et al., 2005). The contemplation ruler is a single item continuum measuring from 0-10 with 0 representing the statement 'I never think

about my drinking' and 10 representing the statement 'My drinking has changed. I now drink less than before'.

Materials

*Video recording*

To measure drinking behaviour, the experimental sessions were recorded using a video camera (Tenvis wireless camera JPT3815W). Video recordings were scored using the coding software ELAN (Lausberg & Sloetjes, 2009). Measures included total drink time (minutes) and total number of sips taken.

Outcome Measures

*Drinking speed & Taste test* (*see Appendix 12)* (Jones et al., 2013). Participants were provided with 250mls each of Fosters, (4%, ~0.12g/kg based on a 70kg person). The main outcome measure was drinking speed (minutes) and the secondary outcome measure was number of sips. To provide a plausible reason for consuming alcohol participants were asked to complete a taste rating assessment of the drinks consisting of a 10 point Likert scale of the following attributes: 'fruity', 'smooth', 'sweet', 'refreshing', 'bitter', 'strong tasting', 'gassy', 'pleasant', 'light', 'tasty'. Taste ratings were not analysed.

*Alcohol Urge Questionnaire (AUQ, see Appendix 9 and page 57 for a full description)* (Bohn et al., 1995). This is an eight-item state measure that assesses the urge for an alcoholic drink at the time the questionnaire is completed, and is therefore a measure of acute craving. Items are scored across a 7 point Likert Scale from 'strongly disagree' to strongly agree'.

*Qualitative questions (see Appendix 21).* Participants were asked questions on their awareness of the aims of the study and the success of the cover up story. They were then asked qualitative questions to get an insight into individual views on the glasses. These were coded for analysis to examine differences between conditions.

Procedure

Testing took place in a semi-naturalistic bar-laboratory. Sessions lasted up to 30 minutes (when both participants had finished their drinks the researcher returned).

All participants were required to provide a zero breath alcohol reading prior to the study session. Participants gave informed consent and completed the battery of questionnaire measures (PRI, AUDIT, TLFB, RTC, baseline AUQ) before completing the main experimental task.

To disguise the real aim of the study, participants were told that they were taking part in a study investigating the effects of alcohol on social problem solving. Pairs were randomised to receive a glass of beer (250mls each of Fosters, 4%, ~0.12g/kg based on a 70kg person) in either a straight or curved glass. Glasses were based on the shapes used in Attwood et al's (2012) study but were smaller in volume (250mls compared to ~340mls). They were of equal volume, were clear and did not involve any markings (see Figure 8.1 and dimensions of each glass in Table 8.1). All beverages were chilled prior to serving and opened and poured just before consumption. Participants were presented with the beverage and informed that they were required to consume this at their own pace (based on Attwood et al's (2012) instructions) and that this would be followed by a problem solving task. A sports clip (Olympic highlights from 2012) was shown to create a drinking environment similar to a real-life drinking context and the researcher left the lab to ensure participants felt comfortable in the drinking environment. After both participants had finished their beverages they completed a five minute problem solving task (to disguise the true aims), taste ratings and a second AUQ measure. They then completed questions regarding the glasses and specific aspects of the study. Participants were then breathalysed, before being debriefed and compensated for their time. If participants' breath alcohol concentration scores were over 0.17mg/l (half the U.K. legal driving limit), they were advised to stay in the laboratory or signed a waiver to confirm they were aware of their level of intoxication.

**Table 8.1. Dimensions of glasses**

| | *Straight glass* | *Curved glass* |
|---|---|---|
| Height (cm) | 14.00 | 17.50 |
| Width- top (cm) | 5.50 | 7.50 |
| Circumference-bottom (cm) | 5.50 | 2.50 |
| Circumference-top (cm) | 18.50 | 24.50 |

*Figure 8.1. Straight and curved glasses*

## 8.4. Results

Analysis

Research into dyadic interactions shows two individuals' drinking behaviour becomes synchronised when drinking alcoholic beverages, shown by imitation of sips (Larsen et al., 2010; Larsen et al., 2012b). It is suggested that individuals may

(non-consciously) monitor others' and their own drinking behaviour to keep up a similar drinking pace. This indicates that when consuming alcohol with a peer, the speed of consumption is likely to be similar and therefore an individuals' drinking behaviour is nested within a pair. To examine the effect of glass shape on drinking speed we used multilevel modelling for analysis using the software MLWin2.3 (Rasbash, Charlton, Browne, Healy & Cameron, 2010), which allows the handling of nested data. Our dependent variables were the primary outcome of overall drinking time (minutes) and the secondary outcomes of number of sips and AUQ change, we examined whether the independent variable (curved/straight) was related to the outcome measures. We also investigated whether individuals' drinking characteristics (weekly units, AUDIT scores, RTC, baseline AUQ) were related to the drinking outcomes (drinking speed and number of sips). We expected that those in the curved glass condition would have a faster drinking time, and that those with higher weekly consumption, higher AUDIT scores, a larger AUQ and a lower RTC would drink more quickly. We also investigated whether there were any interactions between condition and drinking characteristics.

Data from 4 participants were excluded as they did not finish the alcoholic beverages.

Participant characteristics

Descriptive statistics are presented in Table 8.2. MANOVA indicated there were significant differences between groups on the AUDIT, [F (1, 116) = 4.69, p = 0.03], and RTC, [F (1, 116) = 4.92, P = 0.03], which were both higher in the straight glass condition. Groups did not statistically differ on any other factor. The sample was made up of 90% risky drinkers, identified by an AUDIT score of 8 or above (Babor et al., 2001). Groups significantly differed in percentage of risky drinkers, [$\chi^2(1, N = 116) = 6.59$, p=0.0.01], with 82.15% risky drinkers in the curved condition and 96.67% risky drinkers in the straight condition.

Of the participants, 1 guessed the aim of the study and 13 indicated they more or less understood the aims (e.g. that we were looking at drinking speed or influence of environmental aspects on drinking behaviour). When conducting the analysis with and without these participants, findings did not differ, so they were included in the final sample.

**Table 8.2. Means (±SD) for participant characteristics by condition (N=116)**

| | *Mean scores(±SD)* | | | *Statistics (MANOVA)* | |
|---|---|---|---|---|---|
| | *Curved (56)* *Female (33)* *Male (23)* | *Straight (60)* *Female (33)* *Male (27)* | *Overall (116)* *Female (66)* *Male (50)* | | |
| Variable | | | | *F* | *p* |
| Age (y) | 21.35 (3.25) | 21.12 (3.51) | 21.23 (3.38) | 0.18 | 0.67 |
| RTC ruler (0-10) | 2.52 (2.29) | 3.32 (2.43) | 2.93 (2.39) | 4.92 | **0.03*** |
| AUDIT (0-40) | 13.56 (5.64) | 15.42 (4.97) | 14.52 (5.36) | 4.69 | **0.03*** |
| Weekly consumption (TLFB) (units) | 24.65 (16.25) | 27.79 (18.61) | 26.27 (17.51) | 0.46 | 0.50 |
| Weekly binge (units) | 1.43 (1.02) | 1.63 (1.10) | 1.53 (1.06) | 0.80 | 0.37 |
| Baseline AUQ (7-56) | 20.16 (9.88) | 21.48 (10.69) | 20.85 (10.29) | 0.34 | 0.56 |

p < .05, *p < .01, **p <.001***

TLFB = Time Line Follow Back; AUDIT = Alcohol Use Disorders Identification Test; RTC ruler: Readiness to Change Ruler; Weekly binge = number of binge drinking episodes per week; baseline AUQ = Alcohol Urge Questionnaire

Drinking rate (see figure 8.2)

Consumption time in the curved condition was M = 12.86 (SD ± 5.28) minutes and M = 11.73 (SD ±5.69) minutes in the straight condition. Overall participants consumed the drinks in 12.28 minutes (SD ±5.50) minutes. Males consumed drinks significantly quicker than females, M = 9.67 (SD ±3.94) for males, compared to M = 14.25 (SD ±5.71) for females, [F (1, 116) = 22.75, p = 0.001]. There was an intra-class correlation (ICC) of r = 0.85, p = 0.001, indicating that the majority of the variance in drinking speed was between pairs.

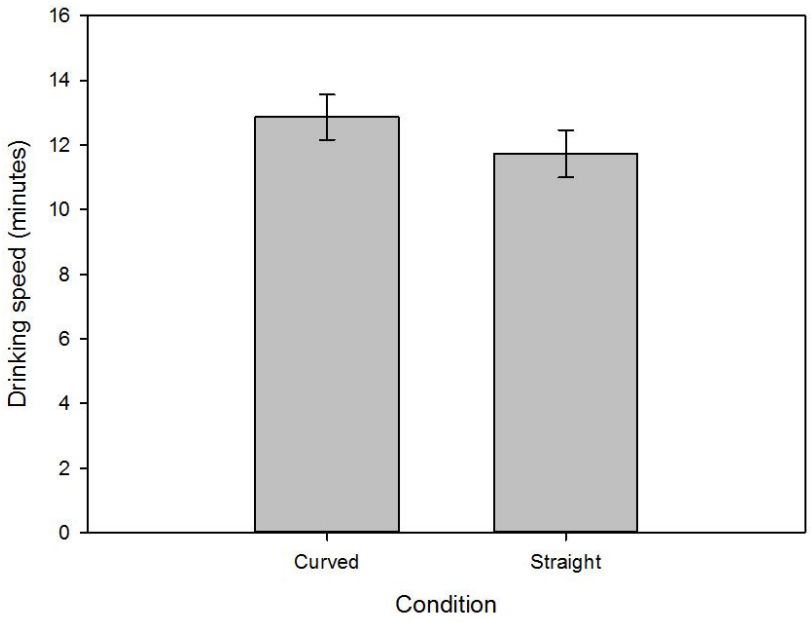



*Figure 8.2. Drinking speed, by condition. Error bars represent standard error of the mean*

Correlations

Pearson's correlations showed weekly consumption correlated significantly with drinking speed in the study, r = -0.24, p = 0.01 (see Table 8.3). A p-value of 0.01 was used to correct for multiple comparisons.

**Table 8.3. Pearson's correlations (N = 116) between drinking speed and drinking characteristics**

| Drinking characteristics | Drinking speed (mins) |
|---|---|
| **Weekly units** | **-0.25**** |
| Weekly binge (units) | -0.09 |
| AUDIT | -0.10 |
| RTC ruler | -0.10 |
| Baseline AUQ | -0.24* |

p < .05, *p < .01, **p <.001**

Multilevel models

Data was organised into two levels, with individuals nested in pairs. Level 1 predictors were drinking characteristics of individuals: weekly units (weekly binge was not included in the models due to high multicollinearity with weekly units), AUDIT, RTC ruler and baseline AUQ. Level 2 predictor was the condition (curved/straight) that the pair was in. Due to baseline differences in AUDIT and RTC these were entered into each model as covariates (fixed factors).

*Drinking speed (primary outcome, see table 8.4)*

In model 1 only the level 2 predictor (condition) was included, and there was no significant main effect of condition, indicating participants did not differ in their drinking by group. In model 2 (full model) all level 1 predictors and the level 2 predictor were included. This model was tested against a parsimonious model (model 3) that only included the significant main effect and condition (weekly units [$\beta$ =-0.07, z = -2.31, p = 0.01]). The significant main effect of weekly units indicates that those that drank a high number of units consumed alcohol more quickly in the experiment. Goodness of fit analyses showed that the model with the significant main effect (model 4) was a significantly better fit than the model with the addition of condition [$\chi2(1) = 0.45$, p = .50], this model (4) was also a better fit than the full model (2), [$\chi2(4) = 5.06$, p = .28].

Adding interactions (condition x drinking characteristic) did not significantly improve the model, all ps>0.11.

Therefore, there were no significant differences between drinking speeds from the two glass shapes. There was a main effect of weekly units, indicating those who drank more units in the week prior consumed alcohol more quickly in the study.

**Table 8.4. Multilevel analyses on drinking speed, by condition and drinking characteristics**

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| | β (SE) | β (SE) | β (SE) | β (SE) |
| Fixed effects | | | | |
| Constant | 12.86 (0.96) | 14.64 (1.50) | 14.78 (1.11) | 14.34 (0.91) |
| Curved/straight | -1.12 (1.34) | -0.91 (1.30) | -0.88 (1.30) | |
| Weekly units | | **-0.09 (0.03)*** ** | **-0.08 (0.02)*** ** | **-0.07 (0.02)*** ** |
| AUDIT | | 0.14 (0.09) | | |
| RTC ruler | | -0.18 (0.16) | | |
| Baseline AUQ | | -0.05 (0.04) | | |
| Random effects | | | | |
| Pair variance | 21.99 (4.85) | 20.60 (4.46) | 21.17 (4.60) | 21.36 (4.64) |
| Subject variance | 7.66 (1.42) | 6.46 (1.20) | 6.79 (1.26) | 6.79 (1.26) |
| -2loglikelihood | 676.01 | 661.52 | 663.13 | 666.58 |

p < .05, *p < .01, **p <.001***

*Number of sips (secondary outcome)*

There was no significant main effect of condition on the number of sips taken to finish the beverage. There was a significant main effect of weekly units [β =-0.14, z = -3.07, p = 0.001] indicating those that drank more units took fewer sips to finish their drinks. There were no other significant main effects, ps >0.18.

No other interactions (condition x drinking characteristic) were significant, ps >0.08.

Therefore, there were no significant differences between conditions for number of sips and those that drank more units took fewer sips.

*Alcohol urge (secondary outcome)*

An AUQ change score (post drink AUQ – baseline AUQ) was calculated and entered into a model with the level 2 predictor (condition). There was no significant main effect of condition on change in alcohol urge [β =2.17, z = 1.34, p = 0.09].

Pair relationships (see figure 8.3)

There was a significant main effect of relationship closeness and drinking speed, [β =0.41, z = 2.06, p = 0.02], with pairs who perceived their relationships as 'closer' consuming their drinks more quickly. There was no significant main effect of the length of time participants had known each other.

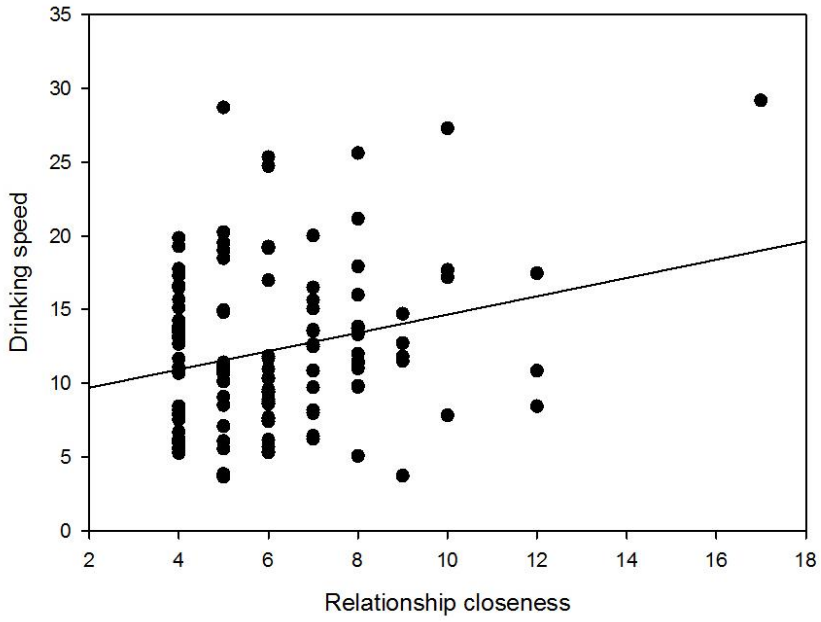


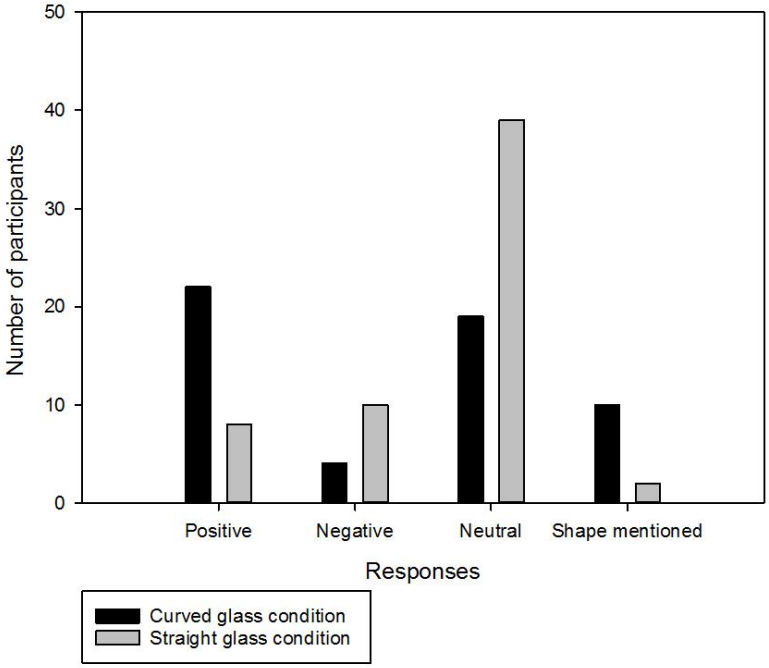

*Figure 8.3. Relationship closeness by drinking speed*

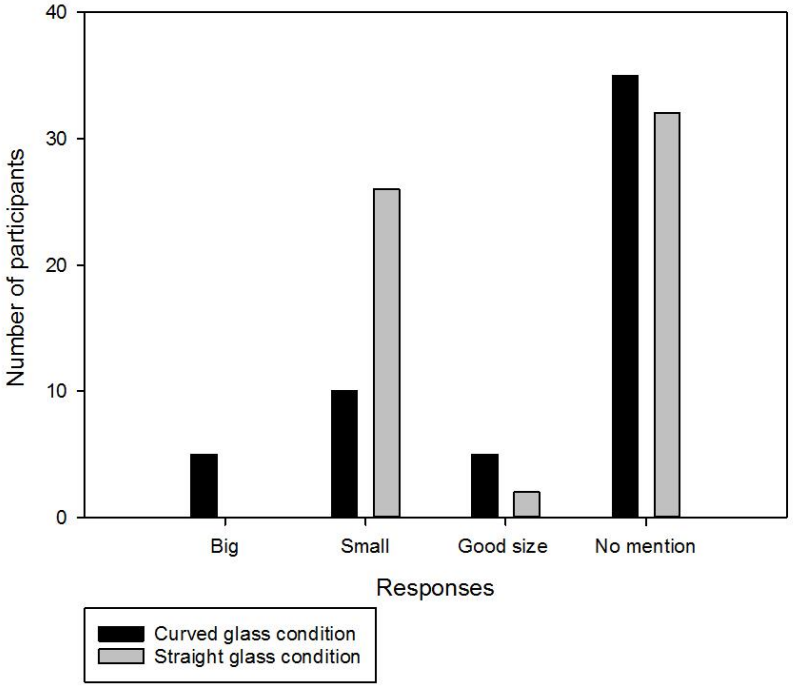
Qualitative questions

Participants were asked qualitative questions to obtain an insight into their views on the glasses and the cover up story. Views on the glass were coded into positive, negative and neutral and it was specified whether answers made reference to size or shape. Views on the sports clip were coded into positive, neutral and negative. Chi squared goodness of fit tests were performed to determine whether the views of the glasses and the cover up story differed between groups.

Views on the glasses (see figures 8.4-8.5)

Views on the glasses were not equal between groups, [$\chi^2$ (3, N = 116) = 14.17, p < .001]. There were more positive views in the curved glass condition and more negative and neutral views in the straight glass condition. Mention of size of the glass were not equal between groups, [$\chi^2$ (3, N = 116) = 13.34, p =.004]. In the straight glass condition participants were more likely to say the glasses were small (z = -2.96, 0.003).




*Figures 8.4-8.5. Qualitative glass questions*

Cover up story

The majority (95.75%) of participants believed there would be a problem solving task. There were no differences between groups in whether participants believed there would be a problem solving task, [$\chi^2$ (3, N = 116) = 3.8, p = 0.15]. There were no differences between groups in positive, negative and neutral views of the sports clip, [$\chi^2$ (3, N = 116) = 2.19, p = 0.33]. There were no differences between groups in whether participants believed the clip affected their drinking behaviour, [$\chi^2$ (3, N = 116) = 3.93, p = 0.42].

### 8.5. Discussion

This study investigated the effect of glass shape on drinking speed in a naturalistic drinking environment. It was hypothesised that, in a semi-naturalistic bar-laboratory with pairs of social acquaintances, drinking speed would be faster from a curved glass compared to a straight glass. Results did not support the hypothesis, as there were no differences in drinking speed of beer between the two glass types.

The baseline differences in AUDIT and readiness to change scores between groups could potentially offer an explanation for the groups' similar drinking speed and lack of support for the hypothesis. The groups consumed their beverages at similar speeds and did not differ in the hypothesised direction. Scores on both these measures were higher in the straight glass condition, suggesting participants in this group were heavier drinkers and would be likely to drink faster. However, a strength of our analysis is that variance in drinking rate associated with the differences in baseline characteristics are accounted for as they were added as covariates in the model. The only measure that was correlated with drinking speed was weekly unit consumption, and this did not differ significantly between groups. The significant main effect of weekly units indicates that those who drank faster in the study reported drinking more units the week before the study. It can be tentatively suggested that drinking quickly will result in higher alcohol consumption over a specific period, therefore this finding is in line other studies showing participants with a high weekly unit consumption consume more alcohol in a lab environment (Koordeman et al., 2014).

The additional investigation on number of sips did not find a significant difference between conditions. This does not support previous research (Attwood et al., 2012)

which found a higher number of sips in the straight glass condition. In both conditions participants who consumed more units in the week prior to the study took fewer sips to consume the beverage. The relationship between number of sips and consumption indicates that heavier drinkers may make take fewer sips to finish their drink (i.e. they gulp more). A positive relationship between heavy alcohol use and gulping has been found in clinical research, with control subjects shown to sip significantly more times than alcoholics (Marlatt, Demming & Reid, 1973). There were also no significant differences between conditions for increase in urge, therefore glass shape did not significantly influence urge for alcohol.

In previous glass shape studies, the proposed reason for different rates in drinking is a perceptual bias (Attwood et al., 2012). It is hypothesised that in a curved glass, the majority of the volume is contained in the upper portion of the glass, which leads to an under-estimation of the true halfway point, and therefore a higher drinking rate. This proposed mechanism may explain why in the current context the glasses were ineffective. Although glass shape alteration is defined as a choice architecture intervention and therefore should not require an active reflective process for behaviour change (Hollands et al., 2013), the proposed mechanism still suggests there needs to be some form of engagement with the glass, as participants would need to be aware of the level of the drink throughout the drinking period. It may be that in a bar-like context with a peer, participants are preoccupied by interactions with their peer and focussed on cues in their surroundings to notice the volume of beverage in their glass. Whereas in a neutral lab environment as a lone drinker, there is less distraction and more attention can be given to the glass. This highlights the importance of investigating such interventions in different contexts but further research is warranted to determine whether attention to the glass is a factor in potential effectiveness, and how explicit this process in.

In the current study (as in Study Three), there was a high correlation between drinking speed of individuals in each pair, indicating a modelling effect. Modelling refers to adapting drinking levels to the consumption of others (Bot et al., 2007; Larsen et al., 2010; Dallas et al., 2014), which is particularly likely with social acquaintances, who share more similarities (Leonard et al, 2000). Peers who are accustomed to drinking together will drink at a similar rate, particularly heavy drinkers, as an individuals' drinking is influenced by the norms of their group

(Room, Callinan & Dietze, 2015). Simple causes trigger a modelling effect; in a situation where alcohol is available, if one person starts drinking quickly then this contaminates others' drinking (Bot et al., 2007). For example, when partaking in 'rounds' in social drinking occasions, those participating are expected to drink at similar speeds (Room et al., 2015); if one individual drinks quickly this is likely to be matched. This modelling effect may be so robust that any adaption in drinking based on glass shape plays a limited role when drinking occurs in pairs or groups. Due to the similar drinking rates within the pairs we investigated the effect of friendship level on drinking rate. Participants were asked questions to determine how close the participants were as friends and how much time they spent together. Study findings indicated a significant main effect of relationship 'closeness', indicating that those who perceived their friendship to be close drank their drinks more quickly. This may be because these pairs are used to drinking together, therefore may feel more comfortable consuming their drinks quickly.

Furthermore, this study was carried out in a bar-laboratory, creating a context similar to that of participants' usual drinking environments. Context of drinking has an impact on alcohol-related behaviours. Alcohol expectancies have been shown to vary depending on context, with greater expectations of stimulation and pleasurable disinhibition in a naturalistic bar setting compared to a neutral lab (Wall, McKee & Hinson, 2000). Positive outcome expectancies have been shown to be associated with increased alcohol consumption in bar environments with friends or peers (Bot, Engels & Knibbe, 2005; Larsen, Engels, Wiers, Granic & Overbeek, 2012a). Disinhibited behaviour, which may lead to an increase in risky behaviour due to impaired inhibitory control (Weafer & Fillmore, 2015), is more likely to be carried out in a relaxing bar environment. Drinking environments contain contextual cues that are reliably associated with the consumption of alcohol (e.g. alcohol, glasses, posters displaying drinks deals, beer mats). These cues are thought to play an influential role in drinking behaviour (Weafer & Fillmore, 2015). There is an attentional bias toward alcohol-related stimuli (Field & Cox, 2008), and alcohol cues lead to more pronounced alcohol-induced inhibition compared to neutral cues (Weafer & Fillmore, 2015). This indicates that the cognitive processes which mediate consumption vary across contexts (Monk & Heim, 2013c). If cognitive processes mediating consumption vary across contexts, this suggests intervention

success may also vary across context. Despite choice architecture interventions not requiring conscious engagement to work, drinking behaviour in some contexts may still be less susceptible to change than more netural contexts.

Characteristics of the glasses used could also explain why findings differed to those in Attwood et al's (2012) study. Although the glasses were a similar shape, they held less volume in the current study (250mls compared to 340mls). It could be that the effects of glass shape are more pronounced with a larger volume of liquid. Furthermore, despite the glasses in the current study holding the same volume, the curved glass was a little taller (17.5mm vs 14mm). Previous research has shown that participants perceive a tall glass as holding more liquid (Raghubir & Krishna, 1999), as participants focus on the height the liquid reaches, without compensating for the width of the glass. As the curved glass was taller this could explain the slower drinking speed than expected; participants may have believed they were consuming more alcohol and accordingly potentially slowed their rate of drinking. This indicates height of a glass may be another potential avenue that may be efficient in altering drinking rate, and should be investigated further in this context. The height of the glasses is something that is not specified in Attwood et al's study, however, if the glasses were the same height, this could explain why their findings were not replicated in the current study.

In terms of opinions of the glasses, participants in the curved glass condition were more likely to have positive views of the glasses, whereas there were more neutral and negative views in the straight glass condition. In the qualitative question responses, participants described the curved glasses as 'feminine', 'pretty' and 'aesthetically pleasing'. This suggests participants preferred drinking from the curved glass. Shape can often be a differentiating feature of a glass (Attwood et al., 2012), and the current curved glasses are more associated with consuming beer (the drink available in the study). Participants were more likely to say the glasses seemed small in the straight glass condition, compared to the curved, despite them containing the same volume of liquid. This may have been due to the different heights of the glasses. This could also explain why the shorter, straight glasses were viewed more negatively, as participants perceived them as holding less liquid and did not feel they were getting a standard serving of beer. For example participants said they were 'not

used to drinking from a half-pint glass' and they were 'too small'. Future research should replicate this study with glasses of the same height.

The majority of participants (95.75%) in the study believed there would be a problem solving task at the end of the drinking period, and this did not differ between groups. This indicates that the cover up story was successful. Positive, negative and neutral views of the sports clips shown during the drinking period did not differ between groups and there were no differences between groups in whether participants believed the clip may have affected their drinking behaviour. This suggests it is unlikely that these aspects of the study may have explained the absence of expected differences in drinking speed between the glasses.

Due to the contradictory findings in this study compared to previous glass shape studies, it is an area which requires further investigation, with controlled experiments investigating the effect of glass shape in group settings of different sizes, various drinking contexts and in other populations. One potential environment could be drinking at home, drinking off-premise is on the increase (IAS, 2013a) and it could be that encouraging drinking from certain glassware in a home environment could lead to slower drinking, particularly if individuals are unknowingly drinking more than they intended, for example if they believe a glass holds less than it does. Over-pouring studies (Wansink & van Ittersum 2003; Wanswink & van Ittersum, 2005) show that in an environment without pre-set measures, individuals may be more likely to pour and potentially consume more than planned.

This study is the first to investigate the effect of glass shape on drinking behaviour in a semi-naturalistic drinking environment. The study did not find an influence of glass shape on rate of drinking alcoholic beverages. This does not support previous research into the effect of glass shape which shows that participants drink more slowly from a straight glass compared to a curved glass. Choice architecture interventions such as glass shape aim to change behaviour without conscious engagement. Therefore, they may offer promising behaviour change techniques for certain populations, such as young adult drinkers, who usually show a limited willingness to change behaviour. However, the results of this study emphasise the strong situational influence that context has on behaviour; aspects of the environment

trigger drinking habits in individuals and these may over shadow potential beneficial effects of glass shape that are found in a neutral lab environment.

# Chapter Nine

# General Discussion

### 9.1 Outline

The overall aim of this thesis was to investigate the effectiveness of harm-reduction interventions for alcohol consumption in a social drinking, young adult population, consisting of predominantly students. Interventions that make changes to the environment (i.e. choice architecture interventions) and aim to target the impulsive system were compared to those that involve a reflective process, based on the reflective-impulsive model of behaviour (Strack & Deutsch, 2004). In Chapter One the theoretical evidence was discussed and harm-reduction interventions were outlined. Drinking behaviour was described from a dual process perspective, where, depending on specific situations, it can be better predicted by reflective or impulsive systems (Hofmann et al., 2008).

Gaps in the evidence base of research into young adult harm-reduction interventions for alcohol were identified. In terms of interventions that target the reflective system, most involve the provision of information to encourage the self-monitoring of behaviour, such as mass media campaigns or brief personalised interventions (BPIs). Mass media campaigns (such as 'Drink Responsibly' and fear campaigns) have not been shown to be effective as a standalone alcohol consumption reduction method, yet these are often promoted (Anderson et al., 2009a). Furthermore, they are usually only tested outside of a drinking environment. BPIs involve the provision of individualised information to increase awareness of risky drinking behaviour (Riper et al., 2009). Findings with BPIs have been mixed; they have shown promise in US students (Bridges & Sharma, 2015), however in a recent review they did not show additional benefit compared to an active control (Scott-Sheldon et al., 2014). Therefore, further investigation of drinking campaigns was warranted to identify if such strategies are of benefit when delivered in a drinking environment and if BPIs can be effective compared to an active control in a UK student population.

In terms of interventions that target the impulsive system (choice architecture interventions), labelling was investigated as it was emphasised as an under

researched harm-reduction method that could have increased impact if labels were more visible and diverse (Stockwell, 2006). Knowledge of unit and standard drink information is poor, particularly in those who drink above the guidelines (Cotter et al., 2013) This was suggested to be due to labels typically being limited to alcohol packaging, and many drinking occasions not involving the consumer seeing the alcohol package (Wilkinson & Room, 2009). Therefore, including health information in the form of labels on the side of the glass is a potential novel direction for labelling research. Furthermore, it was highlighted that nutritional information is under used and may be more effective than unit/standard drink content (Martin-Moreno et al., 2013). Individuals may find it easier to translate the significance of this more commonly viewed and understood information into actual health risks. Choice architecture interventions that involve less conscious engagement include structural changes to the environment, such as changes in glass shape. The use of a straight glass to reduce drinking has shown promise in a recent study (Attwood et al., 2012). However, it is an area with a limited evidence base and it was identified that positive findings require replication.

The chosen interventions were delivered to a young adult, mainly student population, as these individuals are a high-risk drinking group. For example, the number of alcohol-related hospital admissions of 15 to 24-year-old patients increased by 57% in males and 76% in females from 2002 to 2010 (IAS, 2013b) and overall A&E costs attributable to alcohol are £3.5 billion a year (PHE, 2014). However, students may not feel the need to reduce their drinking (i.e. low readiness to change) and the university environment often promotes heavy drinking. Together this may make it particularly difficult to successfully change behaviour by targeting only the reflective system. Therefore, suggesting that making changes to the pro-drinking environment by utilising choice architecture interventions may be more successful in reducing harmful drinking in the current population.

From a theoretical perspective, this thesis asked three key questions 1) Can we target the reflective system and change drinking behaviour outside of the drinking environment? 2) Can we target the reflective system and change drinking behaviour in the drinking environment? 3) Can we target the impulsive system and change drinking behaviour in the drinking environment?

## 9.2 Main findings

### 9.2.1 Effectiveness of interventions that targeted the reflective system

The first experimental Chapter of this thesis (Chapter Two [Study One]) employed a between subjects design to compare an active control (engagement with alcohol information) with a BPI to investigate the effectiveness of personalised feedback on alcohol consumption over a two week follow-up period . The BPI was compared to an active control as previous research indicates that active controls can be as effective as BPIs and may contain similar components of behaviour change (Scott-Sheldon et al., 2014). Engagement was encouraged by using a quiz format to increase interaction with health information, based on the alcohol section ('Choose Less Booze') of the Change4Life alcohol campaign website. The BPI was based on a brief advice tool used in the SIPS alcohol screening and intervention (ASBI) research programme (Drummond et al., 2014), which was funded by the UK Department of Health (2009). The results demonstrated that both groups significantly decreased their alcohol consumption and weekly binges to a similar extent when assessed at two-week follow-up. The active control group, but not the BPI group, also showed small increases on readiness to change (RTC). There were no differences between groups in the recall of information at follow-up. These findings support previous research suggesting BPIs are effective in young adults (Bridges & Sharma, 2015), but offer no additional benefit to active controls (Scott-Sheldon et al., 2014). It was suggested that it was the combined effect of the screening component of the intervention (improvements are often found in assessment-only control groups [McCambridge & Day, 2008]) and the engagement with the alcohol information that contributed to the success of the active control condition. The mechanism suggested for behaviour change in both conditions was the self-regulation component of each. Self-reporting of drinking behaviour and the awareness of risky drinking initiates self-monitoring and can lead to the recognition of an inconsistency between current behaviour and a personal standard. This results in an alteration of behaviour to be more in line with an individual's self-concept (Moos, 2008). An advantage of active controls is that they are cheaper and quicker than BPIs (WHO, 2009), therefore identifying the components that lead to comparable efficacies with BPIs is important. This study suggests targeting the reflective system outside the drinking environment

can be effective in this population and that future information-only strategies should focus on maximising engagement with information, i.e. with quizzes.

Chapter Three (Study Two) was designed to investigate attention to and the effect of anti-alcohol messages (fear-based and 'responsible drinking' messages) and alcohol-related information on motivation to drink in a semi-naturalistic bar-laboratory. The rationale for this was that although research indicates drinking campaigns have little impact on drinking behaviour (Anderson et al., 2009a; Wakefield et al., 2010), there has been little research assessing their impact in a drinking environment, where alcohol is available and individuals are drinking. Furthermore, pro-alcohol messages (in the form of marketing strategies, e.g. Point of Purchase displays) have been shown to initiate or increase drinking (Anderson et al., 2009a; Jones et al., 2015; Skidmore & Murphy, 2011) and may lead to reduced attention to health information (Maynard et al., 2014). Therefore, as these health messages are often provided in an environment alongside messages that promote alcohol, they were compared to pro-alcohol posters. A within participants design (alcohol/placebo dose) was employed to compare the effect of anti- and pro- alcohol messages on motivation to drink (measured by alcohol urge [AUQ], the alcohol purchase task [APT] and the hypothetical alcohol choice task), and attention (gaze time) to the posters was recorded using mobile eye tracking. Results indicated there was a significant increase in alcohol choice in the pro-alcohol poster condition after both drink types. This finding is consistent with research into the effect of marketing methods on drinking behaviour (Anderson et al., 2009b). In the anti-alcohol poster condition alcohol choice remained the same after a placebo dose, whereas in the control poster condition it increased. This shows tentative support for a potential benefit of drinking campaign posters, in attenuating motivating effects of a drinking setting and supporting studies showing the beneficial effects of health campaigns (York et al., 2012). However, no other significant findings were demonstrated for any other motivation measure.

Overall, it was concluded that anti-alcohol posters are ineffective in decreasing motivation to drink, when displayed in a drinking environment. A recent study supported these findings: responsible drinking messages were displayed in a bar-laboratory or a traditional lab and results indicated that they were not well attended to, especially in the bar environment. The study concludes that these messages are

particularly sensitive to context and authors recommend displaying such information in a simple environment (Frings, Eskisan, Albery &Moss, 2017). This suggests engaging the reflective system using health campaigns in an environment containing numerous pro-drinking cues is not effective. As discussed in Chapter One, engaging and using the reflective system to guide behaviour requires self-control. Self-control is a limited resource and deteriorates with repeated exertions and over time (defined as ego depletion [Baumesister et al., 1994]). Drinking cues and intoxication are likely to reduce self-control, consequently making it more likely that behaviour will be led by the impulsive system. Eye-tracking findings indicated increased attention to alcohol cues compared to any other cue (poster and non-alcohol), therefore suggesting the impulsive system is likely to override the reflective system in an environment similar to that an individual usually associates with drinking (Hofmann et al., 2008). This was supported by increases in choice for alcohol in the pro-alcohol poster condition, demonstrating the impact of alcohol cues on motivation to drink. In the reflective-impulsive model attentional bias towards alcohol cues is said to be an automatic response (Strack & Deutsch, 2004). A recent paper proposes that this bias is due to the increased emotional valence alcohol cues evoke (positive and/or negative), which subsequently has a causal influence on proximal drinking behaviour (Field et al., 2016). This supports study findings, and it may be that for students in a bar context, positive feelings associated with alcohol are activated leading to increased drinking behaviour regardless of counter-messages.

Another reason for ineffectiveness of these campaigns is the content of the message. Fear appeals contain a focus on individual responsibility, proposed to be viewed as irrelevant by a younger population (Hastings et al., 2004). Furthermore, a message encouraging ‘responsible or ‘sensible’ drinking may be inappropriate in a population that are not aiming to drink sensibly (Stonard, 2013). This suggests alternative information in which this population place more significance on may be more likely to be engaged with and consequently more effective.

To summarise, Study Two showed a lack of attention to anti-alcohol information in poster form when delivered in a pro-drinking environment, contributing to the ineffectiveness in changing motivation to drink. However, a beneficial effect of alcohol-related information was found in Study One, suggesting engagement with alcohol-related information and self-monitoring of alcohol intake can be of benefit in

changing short-term drinking behaviour when delivered outside a drinking environment. Subsequently, it was concluded that in a typical drinking environment traditional reflective interventions are unlikely to be of benefit, leading to the design of interventions that aimed to target the impulsive system.

### 9.2.2 Effectiveness of interventions that targeted the impulsive system

Study Three (Chapter Four) investigated the effect of a labelled glass, containing unit and warning guidelines on ad libitum alcohol consumption. This was based on the rationale that individuals possess poor knowledge of unit guidelines, particularly heavy drinkers (Cotter et al., 2013). Including labels on the side of the glass is a novel avenue for displaying alcohol information, as labelling is most often limited to alcohol packaging (Wilkinson et al., 2009). This experiment used a between subjects design, comparing labelled glasses (with unit information for specific drinks, a daily intake guideline and a health warning) to plain glasses (control). To create a naturalistic drinking environment this experiment was conducted in a semi-naturalistic bar-laboratory with pairs of social acquaintances. Results indicated that the labelled glass did not significantly reduce ad libitum beer or wine intake over a 20-minute period. Participants indicated that they noticed the labels, therefore suggesting findings are due to characteristics of the labels, rather than a failure to notice them. This supports research showing that unit labels are of limited use, are ineffective in reducing alcohol consumption in their current form (Wilkinson & Room, 2009) and cannot compete against methods that promote drinking (Knai et al., 2015). This may be due to the content of the labels; individuals have a poor understanding of the unit concept and its significance (Martin-Moreno et al., 2013).

Study Four (Chapter Five) investigated the reasons for the ineffectiveness of the unit labelled glass in reducing alcohol consumption using an exploratory focus group design. Two focus groups were conducted to gain an insight into participants' views of the glasses, the content of the labels and their potential to change behaviour. The main findings supported Study Three; most participants indicated they would be reluctant to use the glasses, mainly due to aesthetic reasons and information content. The glass was emphasised as an important aesthetic component of a drinking occasion, therefore highlighting the importance of incorporating glass labels into a more common glass design (e.g. a pint glass). In addition, improvements such as a

more simplistic design were suggested. Participants emphasised that the content of information on the glasses was not likely to be paid attention to or taken seriously, supported by a reasonable existing knowledge of units in this study, which was not used to monitor drinking. Participants, specifically females, emphasised in the focus groups that they were most likely to use calories to monitor their drinking, due to concern over gaining weight. This indicates young adults may be more concerned with short-term, relative to long-term, risks (Cotter et al., 2013) and suggests providing information that is of more relevance to this population may be of benefit compared to current label content.

Studies Five and Six (Chapter Six) aimed to address the limitations and weaknesses of Study Three. Study Four indicated that labels on glasses that are commonly used for consumption may be viewed more positively, therefore the glass labels were designed for common alcohol containers (i.e. pint glasses). Furthermore, alternative information, such as nutritional information, was suggested to hold more significance for a young adult population. It has been emphasised that calorie information should be provided on all alcohol products due to its energy density (Martin-Moreno et al., 2013) and links with obesity (Sayon-Orea et al., 2011). Calorie and unit information was compared to the addition of exercise or food equivalent information. Exercise labels have received recent attention in food research, with findings showing they may be more effective than calorie labels alone (Bleich et al., 2012; Dowray et al., 2013; James et al., 2015). Food equivalent labels were used as research indicates poor knowledge of alcohol calories and their food counterparts (Isted et al., 2015a). Chapter Six designed two studies to investigate whether, compared to no information and unit and calorie information alone, glass labels containing calories with food or exercise equivalents can reduce ad libitum drinking (Study Five) and intention to drink (Study Six). Study Five employed a between subjects design to compare no labels (control) to calorie and unit labels and to the addition of food or exercise equivalent information. Due this being an under researched area and due to the high level of mimicry in Study Three, participants were tested individually in a semi-naturalistic bar-laboratory. Furthermore, in Study Three, although participants stated that they noticed the glass labels, one reason for ineffectiveness may have been that they did not engage with the information. Study One indicated that it was engagement with alcohol-related information (via a quiz) that was key to the

effectiveness of the active control (Clarke et al., 2015). Therefore, in this experiment engagement with the glass labels was encouraged using an alcohol and nutritional knowledge questionnaire. Results indicated that there were no significant effects of the glass labels on ad libitum consumption over a 45-minute period. Due to the gender differences demonstrated in Chapter Five focus group findings in which female participants were most likely to state using calorie information to monitor drinking rather than units, gender differences were investigated with post-hoc analyses. A marginally significant interaction was found: the addition of exercise equivalent information led to a reduced intake compared to calorie and unit information alone. This finding must be interpreted with caution, but warrants the need for further exploration, particularly with a female sample. Study Six employed a between subjects design to compare the labels' effectiveness in reducing intention to drink. An online study required engagement (via a quiz) with volume information (control), unit and calorie labels and the addition of exercise or food equivalent displayed on a variety of drink types. This was followed by two intention measures (likelihood of drunkenness and number of drinks participants were planning to consume in the coming week). Results indicated no differences between groups on either intention measure.

Taking the findings of Study Five and Six together, overall nutritional information appears ineffective in influencing drinking behaviour. This does not support appetite research into similar labels on food (e.g. James et al., 2015). This could be due to the inhibition reducing quality of alcohol compared to food, it is 'no ordinary commodity' (Babor et al., 2010) and leads to an increased 'loss of control' (de Wit, 1996). Consequently methods to change drinking behaviour may not be as straightforward as those that are effective in reducing food consumption.

Study Seven (Chapter Seven) investigated the reasons for the ineffectiveness of nutritional labels in changing drinking behaviour using an exploratory focus group design. Findings indicated that participants generally viewed all glass labels positively (units and calories, exercise equivalent and food equivalent), particularly in comparison to views on unit and guideline labels shown in Study Three. Many participants, particularly female participants, believed the glasses would lead to a reduction in drinking. Although intending to change behaviour may not translate to actual behaviour change (Martinez et al., 2013), this supports the post-hoc findings

from Study Five, in which exercise equivalent labels showed a marginally significant benefit in female participants. Male participants were less likely to indicate that the labels would lead to behaviour change, but emphasised that they could be useful for self-monitoring purposes. Taken together, this indicates the labels warrant further investigation particularly in a female sample. Acceptance of these nutritional labels was high, emphasising that there is no reason why they should not be included on alcohol products.

The evidence from Studies Three to Seven suggests that glass labelling is not sufficient for behaviour change, when implemented in a naturalistic drinking environment. Labelling is described as a choice architecture intervention by Hollands and colleagues (2013), however, in contrast to typical choice architecture interventions that involve a more implicit process of behaviour change, it requires conscious engagement. These experiments indicate that a pro-drinking environment (drinking with others, alcohol cues, consumption of alcohol) may override conscious efforts to engage the reflective system, therefore Study Eight (Chapter Eight) investigated an intervention requiring little cognitive engagement. Study Eight aimed to replicate previous glass shape findings, which demonstrated that in a neutral lab environment alcohol is consumed more slowly from a straight glass compared to a curved glass, due to a perceptual bias leading to an under-estimation of the half-way point of the curved glass and consequently a higher drinking rate (Attwood et al., 2012; Troy et al., 2016). A between subjects design investigated drinking speed of beer from a curved or a straight glass with pairs of social acquaintances in a semi-naturalistic bar-laboratory. Results indicated no differences in drinking speed of beer between the two glass shapes. Although this intervention requires little conscious engagement, if the proposed mid-point hypothesis was the reason for the differences in drinking rate, then some form of engagement with the glass is necessary for monitoring of the liquid level. The distractions from the social drinking setting may have reduced the likelihood that this will have been monitored and hence may explain why the findings were not replicated. Furthermore, supporting findings from Study Three, a modelling effect was demonstrated, this effect may also override any potential effects that glass shape will have had. This suggests targeting the impulsive system in the drinking environment with small structural changes to the environment

has limited effectiveness due to the influence of a pro-drinking environment on consumption behaviour.

### 9.3 Importance and influence of drinking context

In Chapter One the importance of drinking context (e.g. intoxication, alcohol cues, drinking with others) was emphasised. The majority of experiments in this thesis were designed to evaluate interventions in an environment representative of typical drinking environments. The premise of choice architecture interventions is that an alteration to the drinking environment targets the impulsive system and leads to a positive change in drinking behaviour. Thus, it was particularly important that these interventions were evaluated outside of a neutral laboratory, in a semi-naturalistic bar-laboratory. However, the inability of interventions tested in this thesis in changing behaviour may be explained by the influence of the drinking environment.

In Study Two the ineffectiveness of health campaigns was explained by the activation of the impulsive system in the drinking environment. Firstly, eye tracking findings indicated that participants paid more attention to alcohol cues than any other cue, showing posters (anti, pro and neutral) were unlikely to be attended to in a pro-drinking environment. Although this finding may have been due to the greater amount of alcohol cues than any other cue, it tentatively supports research into cigarette packaging, in which participants have been shown to attend to branding over health warnings (Maynard et al., 2014). Furthermore, the increase of motivation measures post bar-lab and after both alcohol and placebo doses emphasised the effect of the environment and consumption on spending behaviour and desire for alcohol. Alcohol Urge and all APT indices increased post bar-lab after both alcohol and placebo administration, with Urge and the maximum amount participants were willing to spend on alcohol *($O_{max}$)* showing more pronounced increases after alcohol. This supports previous research indicating an increase in Urge after a priming dose (Rose & Duka, 2006; Rose & Grunsell, 2008) and an increase in demand indices after exposure to alcohol-related cues (MacKillop et al., 2010; Amlung et al., 2015). Proportion of choice also increased post bar-lab after a placebo dose in the control condition and after both doses in the pro-alcohol poster condition. Therefore, showing the ability of alcohol and alcohol cues to increase alcohol seeking behaviour.

Characteristics of the drinking environment may contribute to the ineffectiveness of interventions designed to target the impulsive system to change drinking behaviour (glass labels [Studies Three, Five and Six] and glass shape [Study Eight]). Firstly, there were many cues related to drinking in the semi-naturalistic bar-laboratory, these cues increase the likeliness that a drink will be consumed even with the intention not to (Hofmann et al., 2008). Furthermore, the majority of participants in these experiments were social drinkers, who show increased response to alcohol cues (Maruven & Schmueli, 2006), therefore they may have required a high level of control to overcome the urges and cravings these cues produce. In addition, these studies involved the consumption of alcohol. It is likely that if alcohol has already been consumed (first few sips of drink) then this may lead to the desire to drink more alcohol (alcohol 'priming'), even if the initial intention before consumption was not to drink (de Wit, 1996). This is because drinking alcohol impairs our ability to inhibit responses, thus our perception may be narrowed down to only salient cues in the environment that could encourage drinking (Hofmann et al., 2008). The anticipated effects of alcohol also increase craving and consumption, shown by a recent study highlighting the important effects of placebo doses (Christiansen et al., 2017).

Impulsive responses are particularly likely to be acted upon when cognitive load is high (Hofmann et al., 2008), and in Studies Three and Eight the experiments required participants to interact with a peer whilst drinking. This is likely to have increased cognitive load and reduced attention to surroundings. There were also high levels of mimicry in both of these experiments (with high intra-class correlations [ICC] of $r = 0.8$ and $r = 0.85$ for Study Three and Study Eight respectively). Individuals' drinking is heavily influenced by the norms of the group they drink with; therefore, particularly with heavy drinkers it would be likely that friends who usually drink together will drink at a similar rate (Room et al., 2015). Although this was accounted for in the analysis, it is posited that this modelling effect may be so robust that potential intervention benefits are overshadowed when drinking occurs in pairs or groups. Due to this high intra-class correlation, the relationship between relationship 'closeness' and drinking behaviour was examined. Significant positive relationships were found between closeness and speed of drinking (Study Eight) and amount of alcohol consumed (Study Three). 'Closer' pairs consumed their drinks more quickly and consumed more alcohol. This suggests that in experimental environments,

individuals who are closer are more likely to demonstrate heavier drinking patterns, potentially due to an increase in comfortability and due to these pairs being more likely to drink together in real-life drinking settings. This supports mimicry research (e.g. Dallas et al., 2014) and emphasises the importance of assessing interventions in pair and group situations.

Focus group findings support quantitative experimental findings and indicate the importance of social factors when drinking. In Study Four drinking motives were investigated to gain an insight into participants' reasons for drinking. Main drinking motives given by participants were for sociability and enhancement, supporting previous research (Kuntsche et al., 2005). Peer pressure was common in drinking occasions, indicating the potential impact peers can have on drinking behaviour (Ham & Hope, 2003). These social factors should be taken into account when designing interventions, as the more students drink for social reasons, the more often they drink (Mobach & Macaskill, 2011). In Study Seven focus groups investigating the views on nutritional glass labels, participants indicated that although they thought calorie information may be effective in reducing intention to drink outside of a drinking environment, they highlighted that once in a pro-drinking setting the glass labels would be less likely to lead to behaviour change. This highlights the difficulty with translating beneficial effects found in lab environments to more naturalistic settings.

Study One resulted in successful behaviour change, with the delivery of a BPI and Active Control outside of the drinking environment. It may be that delivering interventions without the distractions of drinking cues, intoxication and peers may have led to a greater engagement, a key component suggested for the effectiveness of the intervention. However, it is not clear as to the protective effects this intervention may have when individuals come into contact with pro-drinking cues. The influence of the environment as clearly demonstrated throughout this thesis emphasises the need for further research into designing measures to target and restrict the impact of drinking context.

### 9.4 Rethinking the definition of labelling as a choice architecture intervention

Throughout this thesis labelling has been defined as a choice architecture intervention based on Hollands and colleagues' definition of choice architecture interventions as typically not requiring conscious engagement (Hollands et al., 2013), as it is recognised that some interventions that alter the environment do require some level of conscious engagement. However, traditionally labelling may be thought of as an information provision strategy, for example Knai et al (2015) describe labelling as an intervention that falls under the definition of education and persuasive interventions. It is emphasised that there is limited effectiveness of information-based interventions (Marteau, Hollands & Kelly, 2015), based on the emphasis of conscious choice and requirement of intentions to change behaviour.

Hollands et al (2013) emphasise in their paper that there are not many intervention studies that clearly link behaviour change mechanisms with broader definitions of choice architecture. It was highlighted that their work had a different focus to that of previous definitions of nudging and choice architecture research, and the typology outlined in their paper is a valuable framework for the description and evaluation of existing choice architecture interventions. However, this thesis indicates that such interventions vary widely in their proposed mechanisms of behaviour change. Some interventions are directly targeting intentions (BPIs and active controls), others are clearly about changing the environment (glass shape) and others sit between the two (labelling, campaigns). For those in the middle a high degree of conscious engagement is often necessary to change intentions, something that is particularly unlikely when they are delivered in a pro-drinking setting. For future research, labelling strategies may be best described as a more conventional knowledge intention behaviour change mechanism than a choice architecture intervention and the level of conscious engagement should be carefully considered when designing and implementing interventions. This is supported by focus group findings (Study Seven) which emphasised that calorie labelling may lead to a change in drinking intentions, but that labels could be easily avoided and therefore would not necessarily lead to a change in behaviour.

Hollands and colleagues have published a new paper since their previous typology of choice architecture interventions describing a typology of interventions in proximal

physical micro-environments (TIPPME) (Hollands et al., 2017). This is an extension and development of their previous framework which purposefully no longer uses a choice architecture definition for such interventions, but describe them generally as those that change products or environments to alter behaviour. They highlight the lack of perceptual and theoretical clarity in defining choice architecture interventions, suggesting that the placement of an intervention in an environment does not necessarily lead to automatic architected choice. They also introduce a new category: 'information', which encompasses labelling. This supports suggestions in this thesis that labelling may be best described as a traditional information provision intervention, with the key factor for potential success being the delivery in the drinking environment rather than through automatic shaping of behaviour. Using this typology and definition of environmental interventions to describe and report future research in this area may be the most reliable method for increasing the evidence base for effective behaviour change.

## 9.5 Can students drink 'responsibly'?

### 9.5.1 Controlled intoxication

As emphasised in Chapter One, one aim of the Government's Alcohol Strategy (HM Government, 2012) is to encourage 'responsible' drinking through pledges such as providing information to support individuals to make informed choices about their drinking. This thesis investigated the effectiveness of providing information (units and guidelines) in reducing drinking, methods consistently used and promoted in public health behaviour change efforts (Baggott, 2010; Knai et al., 2015). Findings suggest a reasonable existing knowledge of guidelines. In Study One, participants remembered 50% of alcohol-related information in a quiz, in Study Four, existing knowledge of units and guidelines were investigated and results indicated that participants had adequate knowledge of this information. This suggests that a knowledge deficit may not be the problem. This is also supported by previous research indicating that the difficulty in a young adult population is a failure in linking this knowledge with experiences (Seaman & Ikegwuonu, 2010) and that increased knowledge of guidelines is not related to beliefs about responsible drinking limits (Robertson et al., 2014).

Focus groups (Study Four and Study Seven) indicated that government responsible drinking levels are so far removed from existing levels of intoxication that remaining within them is a near impossible feat in the current 'culture of intoxication' (Measham & Brain, 2005). This is supported by findings in Study One, as although the interventions led to reductions in drinking, drinking levels remained above current recommended weekly guidelines. A repeated finding in Study Four was the pursuit of an internal level of intoxication, supporting research on 'controlled intoxication' or 'determined drunkenness' (Measham & Brain, 2005). For example, in a recent study 60% of participants stated they knew before a drinking occasion that they would be getting intoxicated, would plan drinking occasions and have a predetermined level of alcohol to consume (McEwan et al., 2011). This is supported by focus group findings in Study Seven, as participants highlighted they had usually decided how many drinks to consume before their night out. These findings make the use of labels and information provision difficult in this population, as individuals already have a set amount of drinks they plan to consume (Martinez et al., 2013). Study Four findings suggest these internal guidelines vary both between and within individuals and are significantly higher than government guidelines.

Despite this, for many young drinkers, the aim is not to drink to oblivion, and measures are often taken to ensure maximum safety whilst drinking and do not surpass their desired intoxication level. These measures have been given the term protective behavioural strategies, and include not partaking in drinking games, alternating soft drinks with alcoholic drinks and drinking water (Grazioli et al., 2015). Furthermore, research indicates that although risk-taking behaviour is common (Grazioli et al., 2015), the majority of students mature out of their heavy drinking levels. Maturing out is a process that shows a lower level of consumption and problems in later years of study (Heather et al., 2011). This may be expected to continue after students leave university and assume roles and responsibilities of adulthood (O'Malley & Johnston, 2004). However, research shows that many individuals with drinking problems in late adolescence continue to show problems in later life (McCarty et al., 2004). This suggests that identifying those most at risk of future harm is important. However, accepting guidelines are likely to be exceeded in a student population and providing protective behavioural strategies for those

drinking at these levels could be an alternative method of limiting alcohol-related harm in those that continue to drink at high risk levels.

### 9.5.2 Changing drinking culture

Many alcohol harm-reduction methods are fighting a losing battle against a pre-existing drinking culture. Changing any behaviour is difficult and efforts to get individuals to change health related behaviour have had limited success (Kelly & Barker, 2016). Drinking may be even more resistant to change than other behaviours due to the pre-existing culture of intoxication. Students arrive to university expecting to drink heavily and alcohol consumption becomes a deep-rooted part of social life and meaning. For example, in Study Four participants identified that they experienced a change in drinking behaviour when arriving at university, particularly in the first and second years of their degree. Drinking high levels was identified as being synonymous with university and normal. This is supported by low levels of readiness to change found in the samples throughout the experiments in this thesis, reducing the likelihood of intervention effectiveness. Achieving behaviour change in individuals with low motivation to change is difficult, particularly when this lack of motivation is paired with unconscious automatic behaviour (Hardcastle et al., 2015). To change drinking behaviour and attitudes toward drinking long-term, efforts need to target this existing culture. This is not a new idea, it is common in the policy debate, for example Room (1992) stated:

*The call for replacing intoxication with frequent light drinking is essentially a call for youths to act like the middle aged, something which will eventually happen in the individual life-course. Intoxication has function for the drinkers that are not the same as the functions of having one or two drinks- a 'voyage of discovery and self-discovery'. It is doubtful whether teaching children or youths 'responsible drinking' patterns will do much to undo deep cultural associations and values around intoxication. To attain the 'dream of a better society', need to address the matters of social locations and meanings of intoxication* (Room, 1992, p11).

Many interventions are criticised for a failure to take into account the underlying culture with most research favouring measures of harm, frequencies and quantities of drinking (Ally et al., 2016), however existing drinking behaviour is robust and resistant to small changes, evidenced by the findings in this thesis. Recent research

suggests drinking culture is complex, multidimensional and unstable, with many subcultures, and university drinking culture is just one of these subcultures (Ally et al., 2016). We need to understand more about the nature of these cultures to identify what might be successful in changing the behaviour within it.

### 9.6 The potential for the misuse of information

Concerning findings related to the provision of unit and nutritional information were found in the focus groups. In Chapter Four participants indicated that the unit labels could be used in drinking games, supporting research from Jones and Gregory (2009), suggesting unit labels could be used to select stronger beverages and increase consumption. In Study Seven participants highlighted that providing nutritional information and food and exercise equivalents could lead to compensatory eating or exercise behaviours. Furthermore, it was emphasised it was likely the labels could encourage individuals to choose the highest percentage alcohol with the lowest number of calories. This supports research investigating consumption and compensatory behaviours, which suggests that eating low calorie food of smaller quantities and skipping meals prior to and after drinking alcohol is common, particularly in a female population (Bryant et al., 2012).

These findings should not deter from the provision of accurate information (Martin-Moreno et al., 2013), as it may still be employed effectively in those who are actively making efforts to reduce their drinking. Understanding safe guidelines and the nutritional value of alcohol is important, irrespective of the potential for the misuse of information and effects on drinking behaviour (Bailey et al., 2011), but this emphasises the importance of pairing information with education efforts.

### 9.7 Limitations

Whilst it is important to look at the immediate effect of interventions on drinking behaviour, future intervention research should also investigate the long-term benefits of interventions in changing behaviour. For example, it may be that many interventions were not successful as they involved a one-off exposure, and repeated exposure to interventions such as labelling may produce a positive behaviour change over time. Furthermore, in Study One there was benefit of the BPI and active control interventions in changing behaviour over a short-term period of two weeks, but the

impact of these interventions in the current sample on long-term behaviour is yet to be established. A further possibility is that there may be delayed long terms effects, for example an intervention given at the age of 20 may have an increased effect at a later age when an individual feels ready to change.

A limitation of this study is that many of the interventions assessed in this thesis (particularly those requiring high conscious engagement) may not have been effective because the samples were not actively trying to change their drinking (demonstrated by low RTC scores), as those wanting to change are also more likely to benefit from an intervention (Prochaska, Diclemente & Norcross, 1993). Motivating individuals to change behaviour is a significant challenge to the effectiveness of interventions, and successful strategies that achieve behaviour change in those with low RTC are limited (Hardcastle et al., 2015). However, health policy aims to reduce risky drinking regardless of whether or not the individual drinker wants to drink in less harmful way. Therefore, future methods should aim to develop strategies which may be of more benefit to those with low RTC scores. In addition, although the majority were drinking over the recommended guidelines, they were not in the highest risk category. It could be that harmful drinkers (e.g. over 50 units for men and over 35 units for women [IAS, 2013a]) may show more promise in terms of drinking reductions. For example, it has been shown that the highest risk groups of drinkers are most likely to recall a warning message (Stockwell, 2006). Therefore, successful interventions (e.g. Study One) may have increased effectiveness in heavy drinkers who are looking to change their consumption behaviour and the associated consequences.

A further limitation is the use of self-report measures (TLFB) to capture a change in drinking behaviour in Study 1. Self-reports are subjective and it has been indicated that participants may under report their consumption (Greenfield, Bond & Kerr, 2014), particularly if they were aware of study aims. However, other studies have indicated that self-reports have been shown to be a reliable and valid approach for measuring alcohol consumption (Del Boca & Darkes, 2003) with a high correlation between biological measures and self-report measures (Armitage et al, 2014). In future, the combination of multiple data sources (such as biological measures) to validate self-report measures would be of worth. In addition, although effective for capturing short term drinking behaviour, for longer term recall of consumption and

patterns of use retrospective recall is not likely to be as accurate (Neal et al., 2006), therefore alternative or additional measures may be necessary.

Another limitation is the small sample sizes in the experiments throughout this thesis. Although power calculations were carried out for each experiment, these calculations were based on medium to large effect sizes. The interventions researched throughout this thesis may produce small effects not detected with these sample sizes. For example, Study Two and Study Seven produced marginally significant findings, therefore suggesting replication with a larger sample. However, it could be argued that effects this small are not worth finding and that it would be of higher worth to target drinking behaviour with interventions that have a larger influence on drinking behaviour.

### 9.8 Future research

Findings of this thesis are an important addition to existing intervention research. This thesis has identified that interventions can be effective in a young adult population. Study One demonstrated that BPIs and active controls, which both involve the reporting of one's drinking, engagement with alcohol-related information and a reflective process can reduce drinking. Findings suggests information campaigns and labels in their current form should not continue to be a priority in harm-reduction strategies. Furthermore, this thesis highlights that choice architecture interventions, such as glass shape, should be replicated in naturalistic environments before they are implemented.

As Study Five was underpowered to investigate gender differences and showed promising findings regarding exercise equivalent labels in a female sample, this is an area that most certainly requires further investigation. Labelling is low cost and glasses prove a novel and generally accepted form of delivering information in this population. Therefore, future research should investigate these glass labels with information relatable to a young adult sample. However, interventions that use an information approach will not change behaviour alone, it has been emphasised that drinking cannot be easily altered by changing knowledge deficits (Kelly & Barker, 2016). Previous research indicates that campaigns and information provision are important in providing support for a change in environments (DeJong, 2002), suggesting that a combination of methods may prove most effective. Study One

indicates the potential for quizzes to maximise engagement and the importance of self-monitoring techniques, thus it is recommended these methods should be paired with information provision approaches. A recent study used Facebook to incorporate quizzes alongside health tips as part of a weight management intervention for adolescents and concluded it was received well by participants (Woolford, Esperanza Menchaca, Sami & Blake, 2013), suggesting social media platforms show promise as a viable delivery platform for such interventions.

Future intervention research should clearly outline the proposed mechanism of behaviour change, particularly for choice architecture interventions. For example, distinguishing between those that target the automatic system alone (i.e. structural changes), and those that require more conscious effort (i.e. labelling). This distinction will help identify the important components of interventions and the mechanism by which they may lead to a change in behaviour.

This thesis has also emphasised the importance of delivering harm-reduction interventions in a drinking setting and the impact the drinking environment can have on consumption behaviour and motivation to drink. It is recommended that any intervention is tested in a naturalistic drinking environment before its use is encouraged at a population level. In addition, harm-reduction intervention research should employ a mixed method design when investigating new behaviour change techniques. The use of focus groups in this thesis was of great value in exploring views, clarifying experimental study findings, and informing experimental design.

### 9.9 Policy implications

Current policy consistently promotes pledges favouring information and communication (Knai et al., 2015), which as standalones are ineffective in reducing alcohol consumption. The majority of existing policy measures assume that access to relevant health information promotes healthy behaviour, however the reflective-impulsive model of behaviour change suggests this is not the case (Strack & Deutsch, 2004). This thesis indicated that engagement with information and self-monitoring of drinking can reduce consumption if the reflective system is engaged with, therefore policy makers should emphasise that campaigns involving information provision need an active process for success.

Labelling is important for information and monitoring purposes, but will not change behaviour alone. Furthermore, current labels contain information that individuals (particularly younger individuals) find it difficult to relate to. An important finding was the acceptability of nutrition labelling, as this information is received more positively and seen as having more potential effectiveness by a young adult population. As emphasised in Chapters Six and Seven, it is remarkable that nutritional labelling is not already provided on alcohol when it is compulsory on food products (Martin-Moreno et al., 2013), therefore this should be promoted. However, findings in this thesis indicate this should be combined with methods to prevent the misuse of this form of information.

A problem with many existing policies is the involvement of the industry, for example with the responsibility deal (HM Government, 2012). Research shows that campaigns (e.g. 'drink responsibly' campaigns) associated with the alcohol industry may be less effective and can even reinforce drinking attitudes and norms perceptions (Pettigrew et al., 2016). The industry have a duty to discourage harmful drinking, but it should be acknowledged that measures promoted by industry are often not the most effective methods and thus they should have no role in designing or implementing alcohol policy (Babor et al., 2017). The studies in this thesis indicate that the drinking environment and existing culture of intoxication may limit the effectiveness of many interventions that aim to encourage healthier choices. This stresses the need for other methods that may assist in an overall change in the drinking culture (e.g. by restricting the pro-drinking environment), delivered alongside existing measures, independent of the industry (Monteiro, Babor, Jernigan & Brookes, 2017).

### 9.10 Concluding comments

This thesis investigated the effectiveness of a variety of interventions aiming to reduce alcohol consumption in young adult social drinkers, each falling under two broad headings: those that target a reflective process and those that target an impulsive process, of behaviour change. It was indicated that interventions targeting a reflective process by providing information and encouraging self-monitoring of behaviour can be effective, if engagement is maximised. Findings indicate that exercise labelling may show beneficial effects, particularly in a female sample,

therefore future research is warranted. Overall, choice architecture interventions targeting the impulsive system (labelling and glass shape) were ineffective in changing behaviour, and these studies highlighted that clearly defining the proposed mechanisms of behaviour change for such interventions is vital. The increases in drinking behaviour and motivation for alcohol throughout this thesis after exposure to alcohol cues and intoxication emphasises the impact of the pro-drinking environment on behaviour. This in combination with the existing culture of intoxication in students decreases the likelihood interventions will be successful. It is concluded that a combination of interventions targeting both systems may be most beneficial, paired with attempts to restrict the pro-drinking nature of the environment.

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# Appendices

## Appendix 1: AUDIT

For each question, please select your answer and fill in the score given in brackets [ ] in the box.

Note: 1 pint of 5% beer/lager is 2.8 units. 1 glass of 12% wine (175 ml) is 2.1 units. 1 single measure of 40% spirits (35 ml) is 1.4 units.

**1. How often do you have a drink containing alcohol?** ☐

**[0]** Never **[1]** Monthly or less **[2]** 2-4 times a month

**[3]** 2-3 times a week **[4]** 4 or more times a week

**2. How many units of alcohol do you drink on a typical day when you are drinking?** ☐

**[0]** 1 or 2 **[1]** 3 or 4 **[2]** 5 or 6 **[3]** 7, 8 or 9 **[4]** 10 or more

**3. How often do you have six or more units on one occasion?** ☐

**[0]** Never **[1]** Less than monthly **[2]** Monthly **[3]** Weekly **[4]** Daily or almost daily

**4. How often during the last year have you found that you were not able to stop drinking once you had started?** ☐

**[0]** Never **[1]** Less than monthly **[2]** Monthly

**[3]** Weekly **[4]** Daily or almost daily

**5. How often during the last year have you failed to do what was normally expected from you because of drinking?** ☐

**[0]** Never **[1]** Less than monthly **[2]** Monthly **[3]** Weekly **[4]** Daily or almost daily

**6.How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?** ☐

**[0]** Never **[1]** Less than monthly **[2]** Monthly **[3]** Weekly **[4]** Daily or almost daily

**7. How often during the last year have you had a feeling of guilt or remorse after drinking?** ☐

**[0]** Never **[1]** Less than monthly **[2]** Monthly

**[3]** Weekly **[4]** Daily or almost daily

**8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?** ☐

**[0]** Never **[1]** Less than monthly **[2]** Monthly **[3]** Weekly **[4]** Daily or almost daily

**9. Have you or someone else been injured as a result of your drinking?**

**[0]** No **[2]** Yes but not in the last year **[4]** Yes, during the last year

**10. Has a relative or friend or doctor or another health worker been concerned about your drinking or suggested you cut down?**

**[0]** No **[2]** Yes but not in the last year **[4]** Yes, during the last year

**TOTAL:_____**

## Appendix 2: Time Line Follow Back

To help me evaluate your drinking I need to get an idea of your alcohol consumption in the past fourteen days. Please fill out the table with the types and numbers of alcoholic drinks you have consumed on each day, being as accurate as possible. On days when you did not drink please write 0 (zero). I realise it isn't easy to recall things with 100% accuracy, but if you are not sure how many drinks you consumed on a certain day please try to give it your best guess.

Please now fill in the following table stating the total number of alcohol units you consumed for each day. Please start from whichever day it was yesterday and work backwards. For example if today is Monday start from Sunday and work backwards, with Monday being Monday a week ago. Please double check that you have filled in the number of units for all fourteen days.

It might help you to remember any special occasions, e.g. birthdays, parties, sport events, gigs.

**Last week:**

| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|---|---|
| | | | | | | |

**Previous week:**

| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|---|---|
| | | | | | | |

If your drinking over the past two weeks has NOT been typical for you, please fill in the boxes below.

**Typical week:**

| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|---|---|
| | | | | | | |

## Appendix 3: Readiness to Change Ruler

**Readiness to change ruler**

On the ruler below please circle the number that best describes how you feel *right now*:

0 --------1 --------2 --------3 --------4 --------5 --------6 --------7 --------8 --------9 --------10

| | | | | |
|---|---|---|---|---|
| Never think about my drinking | Sometimes I think about drinking less | I have decided to drink less | I am already trying to cut back on my drinking | My drinking has changed. I now drink less than before |

## Appendix 4: Change4Life Quiz

**Use the Change4Life "Choose Less Booze" website to answer the following questions. You will have exactly 15 minutes.**

1. How many units are there in 1 large glasses of red wine (13%)? _____
2. What is the daily-recommended allowance for a male? _____
3. How many calories in 3 pints of beer? _____
4. How many mls in a small glass of wine? _____
5. How many booze free days should you have a week? _____

6. How much more likely are you to get mouth cancer if you drink 2 large glasses of wine or 2 pints of strong lager? _____
7. What is the daily-recommended allowance for a female? _____
8. By how many times is the risk of liver cirrhosis increased if you regularly drink above the lower-risk guidelines? _____
9. When on a night out, how can you help yourself drink less? (give 2 examples)

_____
_____
_____
_____

10. Give two examples of possible ways to pace yourself when drinking

_____
_____
_____
_____

# Appendix 5: Brief Personalised Intervention (SIPS)

## This is one standard drink...


How many standard drinks do you drink in a week?

## ...and each of these is more than one standard drink.


## This table tells you if you are at risk from drinking alcohol.

| Risk | Men | Women | Common Effects |
|---|---|---|---|
| LOW RISK | 21 units or fewer per week or up to 4 units per day - with two alcohol-free days | 14 units or fewer per week or up to 3 units per day - with two alcohol-free days | • Increased relaxation<br>• Reduced risk of heart disease<br>• Sociability |
| INCREASED RISK | 22 - 49 units per week or regular drinking of more than four units per day | 15 - 35 units per week or regular drinking of more than three units per day | • Less energy<br>• Depression/stress<br>• Insomnia<br>• Impotence<br>• Risk of injury<br>• High blood pressure |
| HIGH RISK | 50 or more units per week | 36 or more units per week | • All of the above and...<br>• Memory loss<br>• Risk of liver disease<br>• Risk of cancer<br>• Risk of alcohol dependence |

## Binge drinking is considered to be drinking twice the daily limit in one sitting (8 units for men, 6 units for women).

There are times when you will be at risk even after two or three drinks. For example, when exercising, operating heavy machinery, driving or if you are on certain medication.

If you are pregnant, it is recommended that you completely abstain from drinking alcohol.

As well as keeping to weekly and daily limits, it is recommended that two days of the week should be alcohol-free.

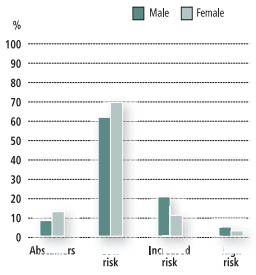
---

## How do you feel?

Your screening score suggests you appear to be drinking at a rate that increases your risk of harm and you might be at risk of problems in the future. What do you think?

SIPS
www.sips.iop.kcl.ac.uk

## What's everyone else like?




## The benefits of cutting down

**Physical**
- Reduced risk of injury
- Reduced risk of high blood pressure
- Reduced risk of cancer
- Reduced risks of liver disease
- Reduced risks of brain damage
- Sleep better
- More energy
- Lose weight
- No hangovers
- Improved memory
- Better physical shape

**Psychological/Social/Financial**
- Improved mood
- Improved relationships
- Reduced risks of drink driving
- Save money

## Making your plan

- Plan activities and tasks at those times you usually drink
- When bored or stressed have a workout instead of drinking
- Explore other interests such as cinema, exercise, etc.
- Avoid going to the pub after work
- Have your first drink after starting to eat
- Quench your thirst with non-alcohol drinks before alcohol
- Avoid drinking in rounds or in large groups
- Switch to low alcohol beer/lager
- Take smaller sips
- Avoid or limit the time spent with "heavy" drinking friends

## What targets should you aim for?

**Men**
4 or less standard drinks daily
21 or less standard drinks weekly
2 alcohol free days a week

**Women**
3 or less standard drinks daily
14 or less standard drinks weekly
2 alcohol free days a week
*(No drinks advised during pregnancy)*

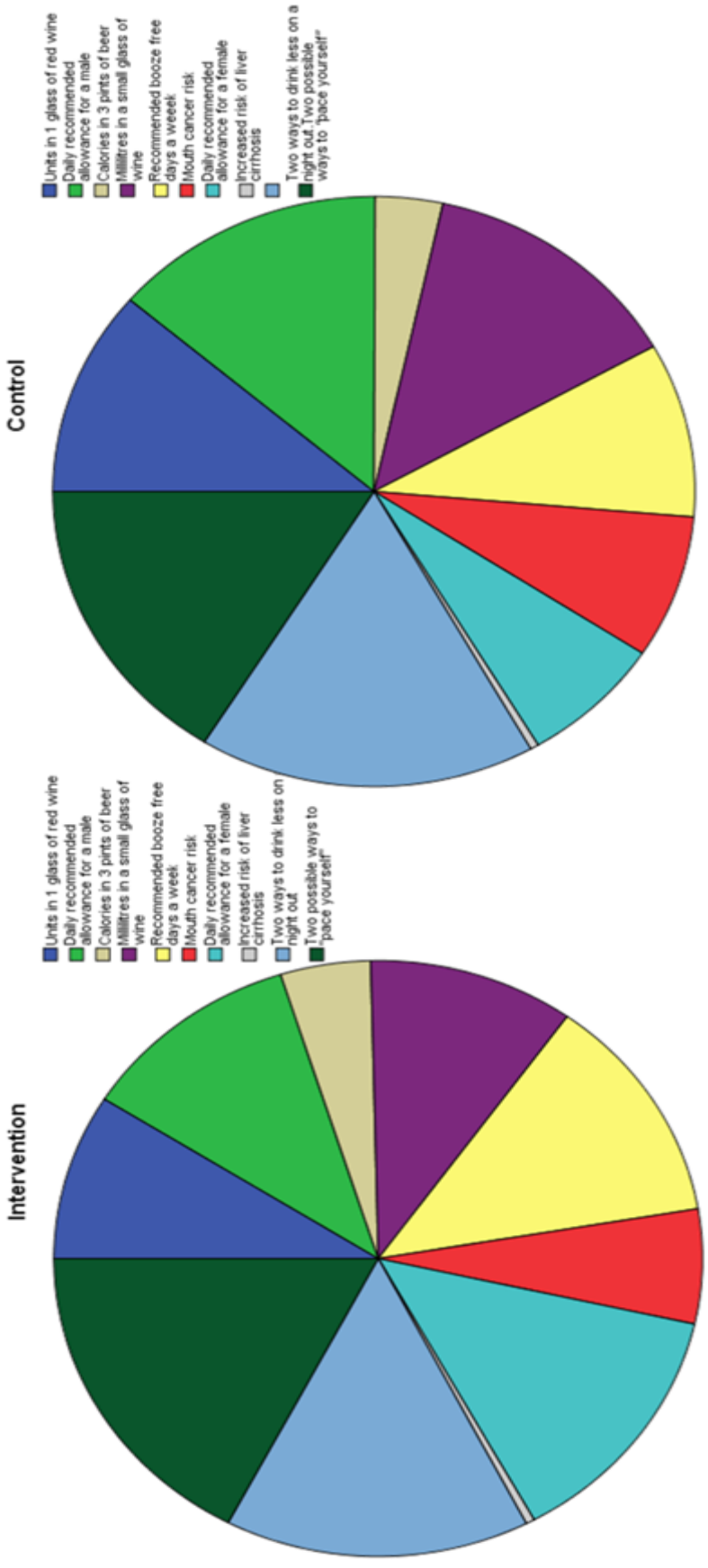
**Dependant drinkers**
No drinks are safe

# Brief advice about alcohol risk

This brief intervention package is based on the How Much Is Too Much? Simple Structured Advice Intervention tool, developed by Newcastle University and the Drink Less materials originally developed at the University of Sydney as part of a W.H.O. collaborative study.

SIPS
www.sips.iop.kcl.ac.uk

Appendix 6: Pie charts showing visual representation of correct answers in change4life quiz (by question) (Study One)



## Appendix 7: Susceptibility to Advertising Questionnaire

**STA** **Subject Number:** **Date:**

1. Advertising makes me aware of products that I need

| Disagree | | | | Agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

2. Commercials provide me with important information regarding products that are advertised

| Disagree | | | | Agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

3. Adverts tell me which brand of product is the best to buy

| Disagree | | | | Agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

4. I pay attention to advertisements because they tell me about products I need

| Disagree | | | | Agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

5. Advertising is sometimes exaggerated: therefore I am reluctant to purchase a product based solely on the ad

| Disagree | | | | Agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

6. I pay little attention to advertisements when I am planning a purchase

| Disagree | | | | Agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

STA questionnaire:

*Barr TF & Kellaris JJ (2000) ,"Susceptibility to Advertising: an Individual Difference With Implications For the Processing of Persuasive Messages", in Advances in Consumer Research Volume 27, eds. Stephen J. Hoch and Robert J. Meyer, Advances in Consumer Research Volume 27 : Association for Consumer Research, Pages: 230-234.*

http://www.acrwebsite.org/search/view-conference-proceedings.aspx?Id=8392

## Appendix 8: Anti- and Pro- Alcohol Posters

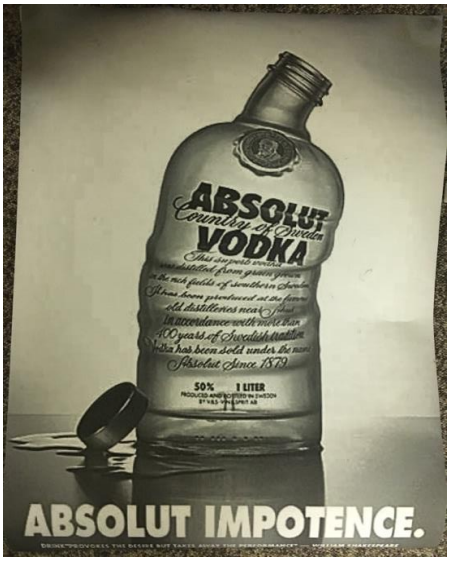
## Pro-alcohol posters

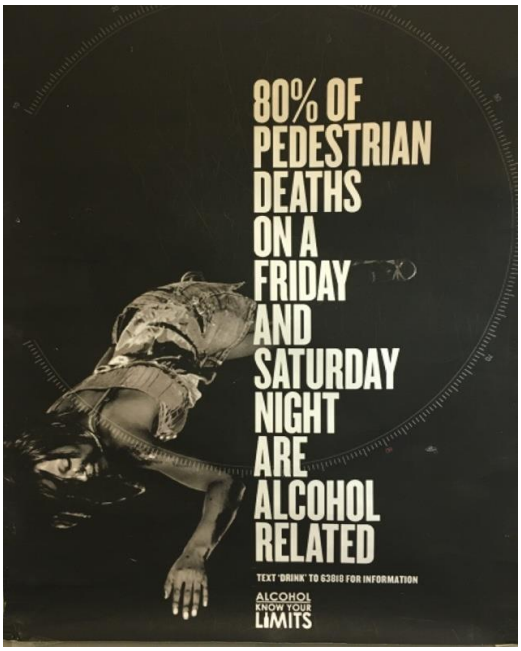




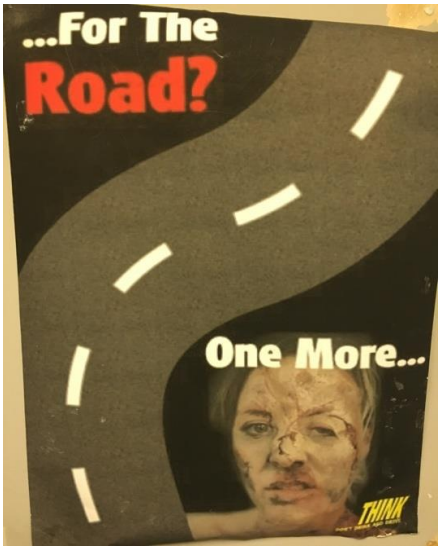


## Anti-alcohol posters






**Appendix 9: Alcohol Urge Questionnaire**

Listed below are questions that ask about your feelings concerning drinking. The words "drinking" and "have a drink" refer to having drink-containing alcohol, such as beer, wine, or spirit. Please indicate how much you agree or disagree with each of the following statements by placing a single mark **(like this : X :)** along each line between STRONGLY DISAGREE and STRONGLY AGREE. The closer you place your mark to one end or the other indicates the strength of your disagreement or agreement. Please complete every item.

We are interested in how you are thinking or feeling right now as you are filling out the questionnaire.

**RIGHT NOW**

1. All I want to do now is have a drink
   STRONGLY DISAGREE:_:_:_:_:_:_:STRONGLY AGREE

2. I do not need to have a drink now
   STRONGLY DISAGREE:_:_:_:_:_:_:STRONGLY AGREE

3. It would be difficult to turn down a drink this minute
   STRONGLY DISAGREE:_:_:_:_:_:_:STRONGLY AGREE

4. Having a drink now would make things seem just perfect
   STRONGLY DISAGREE:_:_:_:_:_:_:STRONGLY AGREE

5. I want a drink so bad I can almost taste it
   STRONGLY DISAGREE:_:_:_:_:_:_:STRONGLY AGREE

6. Nothing would be better than having a drink right now
   STRONGLY DISAGREE:_:_:_:_:_:_:STRONGLY AGREE

7. If I had the chance to have a drink, I don't think I would drink it
   STRONGLY DISAGREE:_:_:_:_:_:_:STRONGLY AGREE

8. I crave a drink right now
   STRONGLY DISAGREE:_:_:_:_:_:_:STRONGLY AGREE

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## Appendix 10: Alcohol Purchase Task

| | |
|---|---|
| 1. How many drinks would you consume RIGHT NOW if they were **FREE?** | |
| **2.** How many drinks would you consume RIGHT NOW if they were **1p each?** | |
| **3.** How many drinks would you consume RIGHT NOW if they were **2p each?** | |
| **4.** How many drinks would you consume RIGHT NOW if they were **5p each?** | |
| **5.** How many drinks would you consume RIGHT NOW if they were **10p each?** | |
| **6.** How many drinks would you consume RIGHT NOW if they were **15p each?** | |
| **7.** How many drinks would you consume RIGHT NOW if they were **25p each?** | |
| **8.** How many drinks would you consume RIGHT NOW if they were **50p each?** | |
| **9.** How many drinks would you consume RIGHT NOW if they were **75p each?** | |
| **10.** How many drinks would you consume RIGHT NOW if they were **£1 each?** | |
| **11.** How many drinks would you consume RIGHT NOW if they were **£1.50 each?** | |
| **12.** How many drinks would you consume RIGHT NOW if they were **£2 each?** | |
| **13.** How many drinks would you consume RIGHT NOW if they were **£3 each?** | |
| **14.** How many drinks would you consume RIGHT NOW if they were **£4 each?** | |
| **15.** How many drinks would you consume RIGHT NOW if they were **£5 each?** | |

| | |
|---|---|
| **16.** How many drinks would you consume RIGHT NOW if they were **£6 each?** | |
| **17.** How many drinks would you consume RIGHT NOW if they were **£7 each?** | |
| **18.** How many drinks would you consume RIGHT NOW if they were **£8 each?** | |
| **19.** How many drinks would you consume RIGHT NOW if they were **£9 each?** | |
| **20.** How many drinks would you consume RIGHT NOW if they were **£10 each?** | |
| **21.** How many drinks would you consume RIGHT NOW if they were **£11 each?** | |
| **22.** How many drinks would you consume RIGHT NOW if they were **£12 each?** | |
| **23.** How many drinks would you consume RIGHT NOW if they were **£13 each?** | |
| **24.** How many drinks would you consume RIGHT NOW if they were **£14 each?** | |
| **25.** How many drinks would you consume RIGHT NOW if they were **£15 each?** | |

**Appendix 11: Pair Relationship Information**

Age:

Gender:

Student, member of university staff or other (please specify):

1. How long have you known the other person that is participating in the study with you?

_____

2. In what capacity do you known the other person that is participating in the study with you?

_____

3. The other person I am participating with is a friend of mine.

Strongly agree  Agree  Unsure  Disagree  Strongly Disagree

4. I know the other person I am participating with well.

Strongly agree  Agree  Unsure  Disagree  Strongly Disagree

5. I spend quite a lot of time with the other person I am participating with.

Strongly agree  Agree  Unsure  Disagree  Strongly Disagree

6. I would say I was similar to the person I am participating with.

Strongly agree  Agree  Unsure  Disagree  Strongly Disagree

## Appendix 12: Taste Test

| Sex |
| --- |
| |

Please consume as much as you like of each drink in order to give your valid assessment for the questions below.

You can take as long as necessary. Please inform the experimenter when you have completed the task.

How fruity was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How smooth was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How sweet was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How refreshing was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How bitter was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How strong tasting was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How gassy was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How pleasant was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How light was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

How tasty was the BEER?

0 1 2 3 4 5 6 7 8 9 10

0= Not at all 10= Extremely.

## Appendix 13: Drink Wise Glass Questionnaire (Study Three)

Drink Wise Glasses

Did you notice the warning and unit labels on the glasses you used?

Do you think it had an effect on how much alcohol you consumed?

Do you think these glasses could be useful in getting people to drink less?

## Appendix 14: Drinking Motives Questionnaire- Revised

### DMQ-R

**INSTRUCTIONS:** Listed below are 15 reasons people might be inclined to drink alcoholic beverages. Using the four-point scale below, decide how frequently your own drinking is motivated by each of the reasons listed.

| I drink… | Never/almost never | Sometimes | Often | Almost always/always |
|---|---|---|---|---|
| 1. As a way to celebrate | 1 | 2 | 3 | 4 |
| 2. To relax | 1 | 2 | 3 | 4 |
| 3. Because I like the feeling | 1 | 2 | 3 | 4 |
| 4. Because it is what most of my friends do when we get together | 1 | 2 | 3 | 4 |
| 5. To forget my worries | 1 | 2 | 3 | 4 |
| 6. Because it is exciting | 1 | 2 | 3 | 4 |
| 7. To be sociable | 1 | 2 | 3 | 4 |
| 8. Because I feel more self-confident or sure of myself | 1 | 2 | 3 | 4 |
| 9. To get a high | 1 | 2 | 3 | 4 |
| 10. Because it is customary on special occasions | 1 | 2 | 3 | 4 |
| 11. Because it helps me when I am feeling nervous | 1 | 2 | 3 | 4 |
| 12. Because it is fun | 1 | 2 | 3 | 4 |
| 13. Because it makes a social gathering more enjoyable | 1 | 2 | 3 | 4 |
| 14. To cheer me up when I am in a bad mood | 1 | 2 | 3 | 4 |
| 15. To be liked | 1 | 2 | 3 | 4 |
| 16. To numb my pain | 1 | 2 | 3 | 4 |
| 17. Because it helps me when I am feeling depressed | 1 | 2 | 3 | 4 |
| 18. So that other wont kid me about not using | 1 | 2 | 3 | 4 |
| 19. To reduce my anxiety | 1 | 2 | 3 | 4 |
| 20. To stop me from dwelling on things | 1 | 2 | 3 | 4 |
| 21. To turn off negative thoughts about myself | 1 | 2 | 3 | 4 |
| 22. To help me feel more positive about things in my life | 1 | 2 | 3 | 4 |

| | | | | |
|---|---|---|---|---|
| 23. To stop me from feeling so hopeless about the future | 1 | 2 | 3 | 4 |
| 24. Because my friends pressure me to use | 1 | 2 | 3 | 4 |
| 25. To fit in with a group I like | 1 | 2 | 3 | 4 |
| 26. Because it makes me feel good | 1 | 2 | 3 | 4 |
| 27. To forget painful memories | 1 | 2 | 3 | 4 |
| 28. So I won't feel left out | 1 | 2 | 3 | 4 |

## Appendix 15: Drink Wise Focus Group Script (Study Four)

Informed consent

*'Before we start- thank you for volunteering for your time and being willing to provide input for the study. It is important that answers to questions remain as confidential as possible, so please refrain from talking about the study once you leave the room. All the information collected about you during the course of the research will be kept strictly confidential and researchers will only be using it for the purpose of the study. You will never be named and there will be no information that can identify you.'*

*'Please try and talk as openly and honestly as possible and try to provide as much detail as possible and elaborate on your answers. There aren't any wrong answers, the aim of the study is to generate an open and interesting discussion.*

Questionnaires assessing alcohol consumption and problems: TLFB, AUDIT, DMQ, RTCQ and RTC ruler.

General questions regarding alcohol consumption, frequency, preferences

- Drinking pattern- how would you describe your alcohol consumption?
- What is your motivation for drinking?

e.g.- for social reasons, dealing with anxiety, dealing with depression, for enhancement reasons, to conform.

Pass around DMQ for participants to read through examples of various motives for drinking, they can then identify if any of the given reasons apply to them.

- Specific questions concerning participants' knowledge about standard drinks
- Are you aware of how many units are in specific drinks?
- Would you pay attention to drinks measurements/labels if they were on glasses?

Pass round glasses.

- What do you think of glasses?
- Would you notice the measure labels?
- Would this influence what or how much they consume?
- Would they promote responsible drinking?
- What kind of population would these glasses appeal to/be most effective?
- Could they be used in the wrong way?

Debrief

## Appendix 16: Dutch Eating Behaviour Questionnaire

**Please answer <u>all</u> questions. Circle the appropriate response.**

| | | | | | | |
|---|---|---|---|---|---|---|
| **When you have put on weight do you eat less than you usually do?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you try to eat less at mealtimes than you would like to eat?** | not relevant | never | seldom | sometimes | often | very often |
| **How often do you refuse food or drink offered to you because you are concerned about your weight?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you watch exactly what you eat?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you deliberately eat foods that are slimming?** | not relevant | never | seldom | sometimes | often | very often |
| **When you have eaten too much, do you eat less than usual the following day?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you deliberately eat less in order not to become heavier?** | not relevant | never | seldom | sometimes | often | very often |
| **How often do you try not to eat between meals because you are watching your weight?** | not relevant | never | seldom | sometimes | often | very often |
| **How often in the evenings do you try not to eat because you are watching your weight?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you take your weight into account with what you eat?** | not relevant | never | seldom | sometimes | often | very often |
| **If food tastes good to you, do you eat more than usual?** | not relevant | never | seldom | sometimes | often | very often |
| **If food smells good, do you eat more than usual?** | not relevant | never | seldom | sometimes | often | very often |
| **If you smell something delicious, do you have a desire to eat it?** | not relevant | never | seldom | sometimes | often | very often |
| **If you have something delicious to eat, do you eat it straight away?** | not relevant | never | seldom | sometimes | often | very often |
| **If you walk past a baker, do you have a desire to buy something delicious?** | not relevant | never | seldom | sometimes | often | very often |
| **If you walk past a snackbar or café, do you have a desire to buy something delicious?** | not relevant | never | seldom | sometimes | often | very often |

| | | | | | | |
|---|---|---|---|---|---|---|
| **If you see others eating, do you also have a desire to eat?** | not relevant | never | seldom | sometimes | often | very often |
| **Can you resist eating delicious foods?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you eat more than usual, when you see others eating?** | not relevant | never | seldom | sometimes | often | very often |
| **When preparing a meal, are you inclined to eat something?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are irritated?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you have nothing to do?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are depressed or discouraged?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are feeling lonely?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you somebody lets you down?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are cross?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are something unpleasant is about to happen?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you get the desire to eat when you are anxious, worried or tense?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when things are going against you and when things have gone wrong?** | not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are frightened?** | Not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are disappointed?** | Not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are emotionally upset?** | Not relevant | never | seldom | sometimes | often | very often |
| **Do you have a desire to eat when you are bored or restless?** | not relevant | never | seldom | sometimes | often | very often |

## Appendix 17: The Obligatory Exercise Questionnaire

By Thompson, J. K. & Pasman, L.

*Directions:*

Listed below are a series of statements about people's exercise habits. Please circle the number that reflects how often you could make the following statements:

1 – NEVER 2 – SOMETIMES 3 – USUALLY 4 – ALWAYS

| | | | | |
|---|---|---|---|---|
| 1. I engage in physical exercise on a daily basis. | 1 | 2 | 3 | 4 |
| 2. I engage in one/more of the following forms of exercise: walking, jogging/running or weightlifting. | 1 | 2 | 3 | 4 |
| 3. I exercise more than three days per week. | 1 | 2 | 3 | 4 |
| 4. When I don't exercise I feel guilty | 1 | 2 | 3 | 4 |
| 5. I sometimes feel like I don't want to exercise, but I go ahead and push myself anyway. | 1 | 2 | 3 | 4 |
| 6. My best friend likes to exercise. | 1 | 2 | 3 | 4 |
| 7. When I miss an exercise session, I feel concerned about my body possibly getting out of shape. | 1 | 2 | 3 | 4 |
| 8. If I have planned to exercise at a particular time and something unexpected comes up (like an old friend comes to visit or I have some work to do that needs immediate attention) I will usually skip my exercise for that day. | 1 | 2 | 3 | 4 |
| 9. If I miss a planned workout, I attempt to make up for it the next day | 1 | 2 | 3 | 4 |
| 10. I may miss a day of exercise for no good reason. | 1 | 2 | 3 | 4 |
| 11. Sometimes, I feel a need to exercise twice in one day, even though I may feel a little tired. | 1 | 2 | 3 | 4 |
| 12. If I feel I have overeaten, I will try to make up for it by increasing the amount I exercise. | 1 | 2 | 3 | 4 |
| 13. When I miss a scheduled exercise session I may feel tense, irritable or depressed. | 1 | 2 | 3 | 4 |
| 14. Sometimes, I find that my mind wanders to thoughts about exercising. | 1 | 2 | 3 | 4 |
| 15. I have had daydreams about exercising | 1 | 2 | 3 | 4 |
| 16. I keep a record of my exercise performance, such as how long I work out, how far or fast I run. | 1 | 2 | 3 | 4 |
| 17. I have experienced a feeling of euphoria or a "high" during or after an exercise session. | 1 | 2 | 3 | 4 |
| 18. I frequently "push myself to the limits." | 1 | 2 | 3 | 4 |
| 19. I have exercised when advised against such activity (i.e. by a doctor, friend, etc.) | 1 | 2 | 3 | 4 |
| 20. I will engage in other forms of exercise if I am unable to engage in my usual form of exercise. | 1 | 2 | 3 | 4 |

## Appendix 18: Alcohol Knowledge (Study Five)

1. How many units of alcohol are in a standard glass of wine (12% ABV, 175ml)?

2. How many units of alcohol are in a standard pint of beer (5% ABV, 568ml)?

3. How many units of alcohol are in a standard shot of vodka (37.5% ABV, 25ml)?

4. Are there more calories in a can of coke (330ml) or a standard glass of wine (12% ABV, 175ml)?

5. Are there more calories in a McDonald's Big Mac or 3 standard pints of beer (5% ABV, 568ml)?

6. How many minutes of jogging would you need to burn off the calories from a standard glass of wine (12% ABV, 175ml)?

## Appendix 19: Awareness and Qualitative Questions (Study Five)

### Awareness

1. Did you think you were being filmed during the experiment?

RESPONSES: “To measure reaction to the comedy show", "To measure alcohol consumption", "You were not really being filmed", "Unsure"

2. Did you think we were measuring your alcohol consumption in the experiment?

RESPONSES: "Yes", "No", "Unsure"

3. Did you think the alcohol may have affected your comedy perception?

RESPONSES: “Yes", "No", "Unsure"

4. Do you think the information on the side of the glass affected your alcohol consumption?"

RESPONSES: “Yes", "No", "Unsure"

### Opinions on glasses

1. Did you notice the labels on the side of the glass?

RESPONSES: “Yes", "No", "Unsure"

2. What were your views on the glasses you were drinking from and did you think they may have affected your drinking behaviour?

3. What did you think of the QI episode you were shown whilst drinking?

4. Do you think the clip may have affected your drinking behaviour in any way?

## Appendix 20: Focus Group Script (Study Seven)

**Alcohol focus group script (calorie labels)**

*'Before we start- thank you for volunteering for your time and being willing to provide input for the study. It is important that answers to questions remain as confidential as possible, so please refrain from talking about the study once you leave the room. All the information collected about you during the course of the research will be kept strictly confidential and researchers will only be using it for the purpose of the study. You will never be named and there will be no information that can identify you.'*

*'Please try and talk as openly and honestly as possible and try to provide as much detail as possible and elaborate on your answers. There aren't any wrong answers, the aim of the study is to generate an open and interesting discussion.'*

***Questionnaires- TLFB, AUDIT, RTC ruler, DMQ, DEBQ & EXERCISE RESTRAINT***

*Pass round glasses- start with calorie/units and then do the same with food/exercise equivalent.*

- What do you think of glasses?
- Would you notice the labels?
- Would you consume your drink from a glass with these labels?
- Do you think this would influence what or how much you consume?
- Would they promote responsible drinking?
- What kind of population would these glasses appeal to/be most effective?
- Could these kind of labels be used in the wrong way?

*After both glasses have been passed round*

- Which of these labels do you think would be most effective and why?

## Appendix 21: Qualitative questions (Study Eight)

Please state below what you believe the true aims of the study were:

_____
_____
_____
_____
_____
_____

What were your views on the glasses you were drinking from?

_____
_____
_____
_____
_____
_____

Did you believe there would be a problem-solving task, if so, what did you think it would involve?

_____
_____
_____
_____
_____
_____

What did you think of the Olympic clip you were shown whilst drinking?

_____
_____
_____
_____
_____
____

Do you think the clip may have affected your drinking behaviour in any way?

_____
_____
_____
_____
_____